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Editorial Note

Resilience Planning: A Short Review and Conceptual Reflections

Iwan Rudiarto

Department of Urban and Regional Planning, Diponegoro University, Central Java, Indonesia

Over the last few decades, the discussion on resilience as an emerging terminology has been frequently found with various viewpoints (Handayani et al., 2019). Resilience discourse is increasingly appearing in many studies, publications, and even academic and practical discussions in different backgrounds. The term resilience is used to describe various issues related to the human dimensions of global change from various perspectives (Spector et al., 2019). Due to its complexity, Davoudi et al. (2012) describe the resilience concept as a multifaceted notion if it is not followed by a suitable context. Furthermore, Meerow et al. (2016) mention that resilience is a term that relates to many aspects depending on the underlying disciplines such as ecology, geography, psychology, or economics, and they even differ from one discipline to another. Resilience can also be interpreted from its entities (Piégay et al., 2020), such as systems, ecosystems, communities, technologies, networks, individuals, populations, and organizations that describe certain conditions of these entities.

As an emerging terminology, Folke et al. (2010) argued that the notion of resilience has emerged as an important concept involving various disciplines in looking at the response to changes in human and ecological systems. Originally, resilience was a concept that focused on the determination of ecological system related to external disturbances (Holling, 1973) and then developed to be a more social context in terms of adaptive capacity (Gunderson and Holling, 2002), community resilience (Adger, 2000), and development resilience (Bousquet, 2014).

Resilience itself comes from the Latin' resilire,' which means to rebound, and also from the French 'résilier,' which means to retract (Piégay et al., 2020), so it is important to define 'resilience to whom' and

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'resilience of what' (Cutter, 2016). In a more specific context to the community, resilience emphasizes the aspect of community capacity across generations to maintain and increase livelihood opportunities from environmental, social, economic, and political disturbances (Insani et al., 2022; Tanner et al., 2015). From a more comprehensive perspective, resilience highlights capacity at various levels, whether in society, community, or even government (Handayani et al., 2019). The development of research and publications in resilience has fostered its own social and political beliefs, which can become the basis for policymaking and planning (Vogel et al., 2007).

Many publications underline the term resilience in adaptive cycles that focus on ecosystems, societies, and economies as dynamic systems where no stable conditions are available but occur frequently through four phases; growth and exploitation, conservation; collapse or release; and renewal and reorganization (Lu and Stead, 2013). Resilience denotes an abstract concept and therefore, defining particular ways to plan for resilience is somehow difficult (Desouza and Flanery, 2013). Moreover, cities consist of complex systems and would be a great challenge on how a city can be resilient. The notion of resilience has been introduced in the planning context in 1990's which emphasizing on urban planning (Mileti, 1999). As further indicated by Godschalk (2003), most literature on resilience planning gives more attention on the preparation and mitigation actions at local scale. A clear example is in the land use planning approach which is used as a way to minimize current disturbances with two major options, i.e., separating specific land uses and coping with potential disturbances reduction in terms of risks and negative effects. This can be done by placing the development in a quite distance from ecologically sensitive areas or flood-prone areas (Lu and Stead, 2013).

Decades later, the literature on resilience planning has expanded to include strategies for mitigating and tackling climate change. Furthermore, the existing literature focuses not only on mitigation but also on adaptation, where mitigation is not always successful in overcoming the disturbance. Resilience studies in both urban and rural contexts (which mostly focus on livelihoods and communities) sometimes ignore the complex and multidisciplinary nature of resilience and apply it incompletely (Jabareen, 2013). Giving on a specific concern or a small portion of aspects contributed to resilience can subsequently override significant characteristics that influence the performance of resilience itself, as resilience has multiple dimensions such as social, economic, cultural, environmental, and spatial. Finally, resilience planning can be considered a planning process that includes actions on how the community can be promoted to deal with access and risks, actions to ensure the communities get access to needs, services, capital, and actions to reduce risks from natural and human-driven hazards. It needs a comprehensive understanding from various dimensions; otherwise, applying resilience as a new paradigm in planning practice could be difficult and meaningless (Stumpp, 2013).

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Research Paper

Measuring the Magnitude of Film Tourism as a Catalyst of the Indonesian Tourism Sector

A Case Study of Laskar Pelangi Film in Belitung Island

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ABSTRACT

The creative economy is a new paradigm to be reckoned with. Unfortunately, film as the priority sub-sector of Indonesia's Creative Economy failed to become one of the five sub-sectors with the largest multiplier effect to other sub-sectors of the creative economy. There is an immeasurable impact of film on the tourism sector which is known as film tourism. This research conducts empirical evidence on the case study of Belitung Island and the Laskar Pelangi film to measure the magnitude of the film tourism effect. The analytical method used in this study is the ARIMA (Autoregressive Integrated Moving Average) intervention modelling. The results of the intervention model show that the Laskar Pelangi film and the Kata Museum of Andrea Hirata have a significant direct effect on the tourist arrival in Belitung Island. Meanwhile, the influence of the Tanjung Kelayang Tourism SEZ was significant almost one year after it was established. The increase in tourist arrival due to Laskar Pelangi film tourism is two times higher than without the effect, indicating that the film tourism phenomenon is possible to become a new form of innovation that is effective as a catalyst for the future of Indonesia's tourism sector.

Keywords: Film tourism, ARIMA intervention, *Laskar Pelangi*.

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1. Introduction

The creative economy sector is a new paradigm to be reckoned with. In 2013, the creative and cultural industries generated US$ 2.25 trillion, or about three percent of the Gross Domestic Product (GDP) produced worldwide (EY, 2015). The United Nations (UN) emphasizes that what makes the creative economy sector different from other sectors is the role of creativity as an intangible stock of capital, thereby placing the same amount of opportunity between developed and developing countries to move optimally in this sector (United Nations [UN], 2008). Following President of Indonesia Joko Widodo's statement, Indonesia may find it challenging to compete in the development of sophisticated industries. However, there is an enormous opportunity in the creative economy sector due to its wealth of arts and cultural heritage (Badan Ekonomi Kreatif, 2019).

Based on the BPS Statistics, the creative economy sector in Indonesia shows a consistent development. The GDP of Indonesia's creative economy sector in 2016 reached 922.56 trillion rupiahs and contributed 7.44 percent to the GDP (Badan Pusat Statistik, 2018). Within six years, between 2010 and 2016, the GDP of the creative economy sector has almost doubled, with an average annual growth rate of 9.82 percent, higher than the rate of economic growth in the same period.

Presidential Regulation No. 72 of 2015 classified the creative economy in Indonesia into 16 subsectors. In the Strategic Plan of the Creative Economy Agency (*Badan Ekonomi Kreatif*) of Indonesia for the 2015-2019 period, it was explained that one of the strategies to strengthen the creative economy sector is the 'Top-Down' strategy, by forming superior and priority sub-sectors. The superior subsectors are culinary, fashion, and craft, which dominate the share of the total GDP in the creative economy. Meanwhile, the priority sub-sectors are considered capable of encouraging economic growth in other economic sectors. The priority sub-sector includes the film sub-sector, applications games, and music. Unfortunately, the priority sub-sector, the film, was not included in the five sub-sectors with the output that has the most significant impact on driving other creative economy sub-sectors (Badan Pusat Statistik and Badan Ekonomi Kreatif, 2018). The small contribution (Figure 1) also causes the national film industry to get less attention from the policymakers and not to be prioritized in realizing the national economic development.

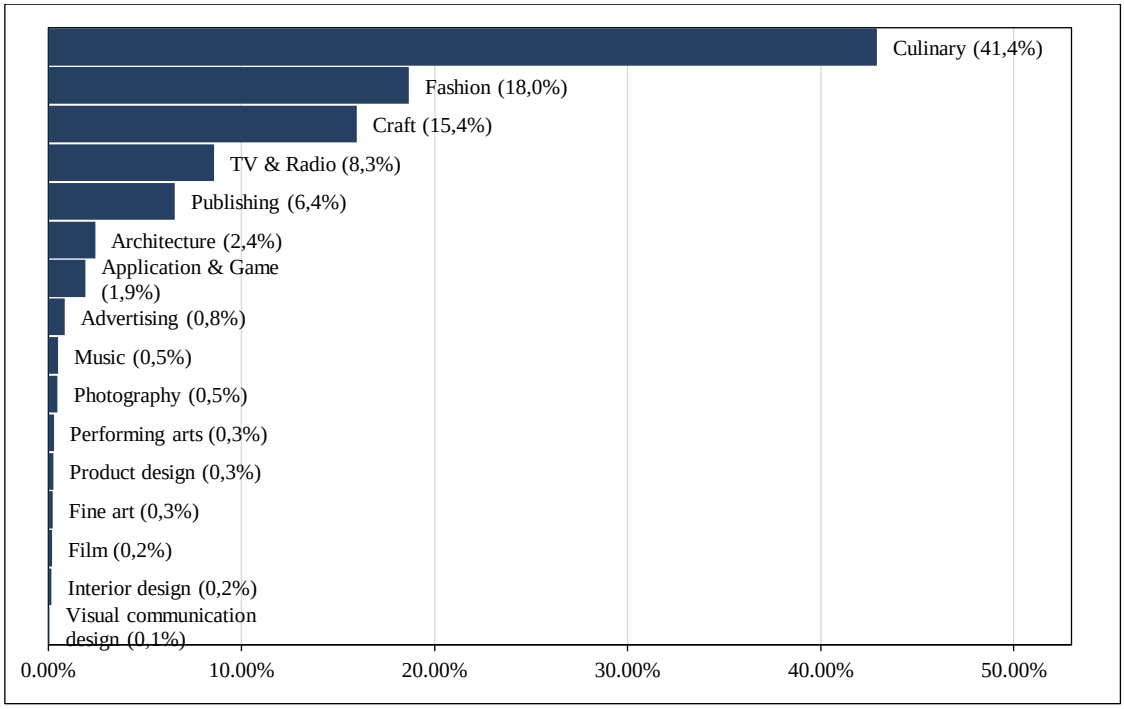

Figure 1. Share of the sub-sector to the GDP of the creative economy sector in Indonesia, 2016 ***Invalid source specified.***

There is an immeasurable impact of film on the tourism sector, which is known as film tourism. Ex-Deputy of Creative Economy Agency for Access to Capital, Fajar Hutomo, stated that there was a domino effect of the film sub-sector on the tourism sector which was not widely realized (Setyowati, 2016). Whereas film tourism has a positive effect on these destinations due to increased growth in their tourism arrivals once the location is used as the setting in the related film (O'Connor & Kim, 2014). However, several conditions are needed to make a film that ultimately has an impact on the tourism sector. The storyline of the film needs to involve the audience's emotional experience with the places depicted in the film (Niziol, 2009). In addition, the film's commercial success in the film market can also be an indication of the domino effect of film tourism (Phomsiri, 2015). Unfortunately, research on film tourism is still relatively rarely touched, even though there has been an increase in the last ten years (Beeton, 2016).

One of the Indonesian films that has raised the background of a place well and attracted a large audience is the *Laskar Pelangi* (Rainbow Troops) film, released in September 2008. *Laskar Pelangi* was a film produced by Miles Films from a novel adaptation by Andrea Hirata, which told the story of children's struggles to access education on Belitung Island in the 1960s (Miles Films, n.d.). The name Belitung Island was increasingly popular through the release of this film. Various tourist objects related to this film were later built, such as a replica of Muhammdiyah Gantong Elementary School and the *Laskar Pelangi* Gallery or the Kata Museum. Kata in Indonesian means' word,' used as the name of the museum by Andrea Hirata, and it is the first literary museum in Indonesia. The national government began to pay attention to Belitung Island by establishing the Tanjung Kelayang Tourism Special Economic Zone (SEZ) in Sijuk District, Belitung Regency, in 2016. This is a strong signal regarding the great opportunity for film tourism to be a catalyst for the future of the tourism sector, especially in areas that were not previously well-known as tourist destinations.

To prove the existence and opportunity of film tourism in Indonesia, this research conducts an empirical case study of Belitung Island and the *Laskar Pelangi* film to measure the magnitude of the film tourism effect. This study compares Belitung tourism to tourism film as an intervention and without intervention. For the research results to be more comprehensive, other things followed the release of the *Laskar Pelangi* film: the construction of the Kata Museum as a destination related to *Laskar Pelangi*, and the establishment of the Tanjung Kelayang SEZ, were also considered. The results of this study can become the basis for the government to start paying attention to film tourism.

Film Tourism

The phenomenon of creating a tourist attraction in a place or area that engages in the film-making process is known as film-induced tourism or film tourism (Roesch, 2009). Research on film tourism is still quite rare, even though there has been an increase in the last ten years (Beeton, 2016). One of the earliest studies is a paper written by Riley and Doren (1992) entitled "Movies as tourism promotion: a pull factor in a push location." The study was conducted on several American films shot in the United States and Australia. In their research, Riley & Doren (1992) described a significant increase in the number of tourist visits to a place used as a film background in descriptive statistical analysis, using time series data of tourist visits to these tourist attractions. They also mentioned an appeal in storylines from the film related to the places as the background. As a result, the number of foreign tourists from the United States visiting Australia increased.

Many countries have succeeded in capturing the existence and taking advantage of film tourism. Oxford Economics (2012) estimated that the United Kingdom (UK) film industry directly contributed around £1.6 billion to UK GDP in 2011. While there is limited robust statistical data quantifying the value of this impact, the available evidence suggests that around a tenth of the value of foreign tourism to the UK may be attributable to UK films. The phenomenon of film tourism in several regions has been shown in Hudson and Ritchie's (2006) study, where the increase of tourists occurred due to Braveheart movie released in 1995. Tourist visits to the Wallace Monument in Ochil Hill, Scotland increased by 300 percent in the first year after the film was released. In the Asia Pacific region, South Korea managed to capture and utilize the phenomenon of film tourism well. Based on data from the Korea Tourism Organization (KTO), of the three million Asian tourists who visited South Korea in 2004, most visited locations where

Korean television series or films were shot, such as those featured in the Winter Sonata movie, released in 2002 (Chan, 2007). Winter Sonata is one of the famous television series that started the phenomenon of the Korean Wave or Hallyu, where South Korean tourism and culture became very popular in other countries and succeeded in inviting foreign tourists to visit South Korea.

Unfortunately, the use of inferential statistical methods in providing empirical evidence regarding the impact of films on tourism has not been widely used. One of them is the research conducted by Corton & Ebrahimpour (2014) on the Dolphin Tale film produced by Warner Bros in 2011. Corton & Ebrahimpour examined the impact of the Dolphin Tale film on the number of visitors to the main shooting location, Clearwater Marine Aquarium in Florida. To calculate the impact of film tourism, Corton & Ebrahimpour compared the difference between the number of visitors before and after film release. They found that film tourism increased tourist visits to the location by 51 percent. This study also predicted the number of tourists who would come to the Clearwater Marine Aquarium by considering the Dolphin Tale film intervention. The study calculated the number of monthly visitors to Clearwater Marine Aquarium analyzed using the seasonal ARIMA model.

Tkalec et al. (2017) also conducted Data-driven research to examine the effect of the Game of Thrones (GoT) series on tourism in one of its shooting locations, Dubrovnik City, Croatia. The method used is a synthetic control approach by building an estimation of the tourist visit to Dubrovnik City if it was not the location for shooting GoT. Estimation was built using a model based on tourism data from other cities in Croatia, which were assumed not to be affected by the GoT film. The effect of the GoT movie is calculated based on the difference between the actual data and the synthetic control data, which assumes that the city does not receive the effects of the GoT. A positive effect was found for Dubrovnik City. It received sixty thousand more tourists every year because of GoT. However, three other countries, Istria, Dalmatia, and Zagreb, receive a more significant effect than Dubrovnik. These cities are major tourist destinations caused by the spillover effect.

Most research about film tourism uses primary data to find out the effect at a micro or individual level. This type of data is good for capturing how the film can influence tourists to visit the shooting location. Young and Young (2008) used the theoretical model of conditional probability to measure the contribution of a screen product to a destination visit. The result showed that 16 out of 100 tourists who visited Oxford were influenced by screen products and as many as 60 out of 100 tourists in London Eye. Analysis using ANOVA was also carried out to ascertain the effect of the film on the motivation of tourists. Rattanaphinanchai and Rittichainuwat (2018) found significant changes after tourists watched 'Lost in Thailand' and 'The Beach', where they had a higher motivation to visit the films' shooting locations in Thailand.

2. Methodology

This research studied tourist visits to Belitung Island, Indonesia. The dependent variable in this study is the total number of tourist visits to Belitung Island from January 2003 to December 2019 in monthly units. There are three intervention variables used consecutively: the *Laskar Pelangi* in September 2008, the construction of the *Laskar Pelangi* Gallery or Kata Museum in September 2012, and the establishment of the Tanjung Kelayang SEZ in March 2016. Data of the tourist visit to Belitung Island is an aggregate of the tourist visits data to Belitung Regency provided by the Government Tourism Office of Belitung Regency and tourist visits data to East Belitung Regency provided by the Government Culture and Tourism Office of East Belitung Regency.

The analytical method used to answer the objectives in this study includes descriptive analysis and statistical inference analysis, namely the ARIMA (Autoregressive Integrated Moving Average) intervention modelling. The main purpose of the ARIMA intervention modelling is to find out how an intervention influences data and forecast it by considering the effects of the intervention (Makridakis et al., 1997).

The general form of the intervention model can be described in a backshift notation (B) by the equation (Box and Tiao, 1975):

$$Y_t = \frac{\omega_s(B)B^b}{\delta_r(B)}\xi_t + N_t \quad (1)$$

where Y_t is observed value in the period of t. N_t refers to the ARIMA model for the data series before the intervention, while the notation $\frac{\omega_s(B)B^b}{\delta_r(B)}\xi_t$ in the equation describes the effect of the intervention event at a certain period in the intervention variable ξ_t (Box et al., 2008). ω and δ are intervention parameters in which ω indicates the magnitude of the influence given by the intervention and δ is the degree of decay of the gradual intervention effect (Box & Tiao, 1975). In general, there are two types of intervention variables ξ_t that can be used in the model, namely (1) step function, and (2) pulse function. The step function (S_t) describes an intervention that starts to occur at a certain time (T) and its existence tends to be permanent, while the pulse function (P_t) describes an intervention variable that only lasts temporarily.

$$S_t^{(T)} \begin{cases} 0 & t < T \\ 1 & t \geq T \end{cases} \quad (2) \qquad\qquad P_t^{(T)} \begin{cases} 0 & t \neq T \\ 1 & t = T \end{cases} \quad (3)$$

There are three intervention notations used in the intervention model: b, s, and r. The b notation is an order that describes when the effect of the intervention is significant. Order s shows a period of time after the intervention where there is a significant change (fluctuation) in the data, while order r identifies the gradual change in residual value (Lee et al., 2011). Statistical software was used to perform ARIMA intervention modelling in SAS University Edition.

In this study, the descriptive analysis was used to describe the condition of data on tourist visits to Belitung Island from January 2003 to December 2019. Furthermore, the ARIMA intervention model was developed to see and measure the effect of the *Laskar Pelangi* film, Kata Museum, and the Tanjung Kelayang SEZ on tourist visits to Belitung Island. The ARIMA intervention model formed in this study is multi-input model as follows:

$$Y_t = \frac{\omega_s(B)B^b}{\delta_r(B)}S1_t + \frac{\omega_s(B)B^b}{\delta_r(B)}S2_t + \frac{\omega_s(B)B^b}{\delta_r(B)}S3_t + \frac{\theta_q(B)\Theta_Q(B)e_t}{\phi_p(B)\Phi_P(B)(1-B^{Seasonal})^D(1-B)^d} \quad (4)$$

Where Si_t is the i-th intervention variable in the step function, with parameters ω_s, and δ_r. Whereas θ, ϕ, Θ, Φ are the parameters of the pre-intervention ARIMA model with orders (p, d, q). θ is a parameter of the order, q represents the lag of the past error used in the model, meanwhile ϕ is a parameter of the order p, the lag of the autoregressive process (how the past value of the data influences the present value). q is the order of the integrated process, differencing the data because of non-stationary problems. Θ and Φ are the parameters of Q and P, as well as p and q b for a seasonally adjusted model, $\mathrm{SARIMA(p,d,q)(P,D,Q)}_s$ with s seasonal lag. Following are the stages of conducting the ARIMA intervention model:

1. Grouping time-series data based on the time of interventions:
   a. Pre-intervention period: January 2003 – August 2008;
   b. First intervention period: September 2008 (the release of *Laskar Pelangi* film) – August 2012;
   c. Second intervention period: September 2012 (the opening of Kata Museum) – February 2016;
   d. Third intervention period: March 2016 (the inauguration of Tanjung Kelayang SEZ) – December 2019.
2. Testing the assumption of variance stationarity using the Box-Cox test and the average stationarity using Augmented Dickey-Fuller (ADF) test.
3. Formating pre-intervention ARIMA model for pre-intervention data.
4. Forecasting for the first intervention period uses the pre-intervention ARIMA model. Plot the residuals, namely the difference between the forecast result and the actual data of the first intervention period to determine the orders of b, s, and r in the first intervention model.

5. Formating first intervention ARIMA model for pre-intervention and first intervention period data.
6. Repetition for the second and third interventions, starting with forecasting to determine the orders of the next intervention period (step 4).

Model formation at the described stages includes model identification, parameter estimation, and the diagnostic test, including the residual independence test with the Ljung-Box test and residual normality test with the Kolmogorov- Smirnov test.

3. Result and Discussion

Based on Constitution No. 5 of 2003, Bangka-Belitung Island Province was divided, resulting in Belitung Island consisting of two regencies, namely Belitung Regency and East Belitung Regency. During 2003, there were 7,248 tourist visits to Belitung Regency and only 792 visits to East Belitung Regency. Accumulatively, there were 8,040 tourist visits to Belitung Island throughout the year. This grew to more than one hundredfold to 812,396 visits during 2018. Unfortunately, in 2019 there was a decline, where there were only 627,640 tourist visits to Belitung Island. A detailed increase in tourist visits to Belitung Island is displayed in the monthly period in Figure 2.

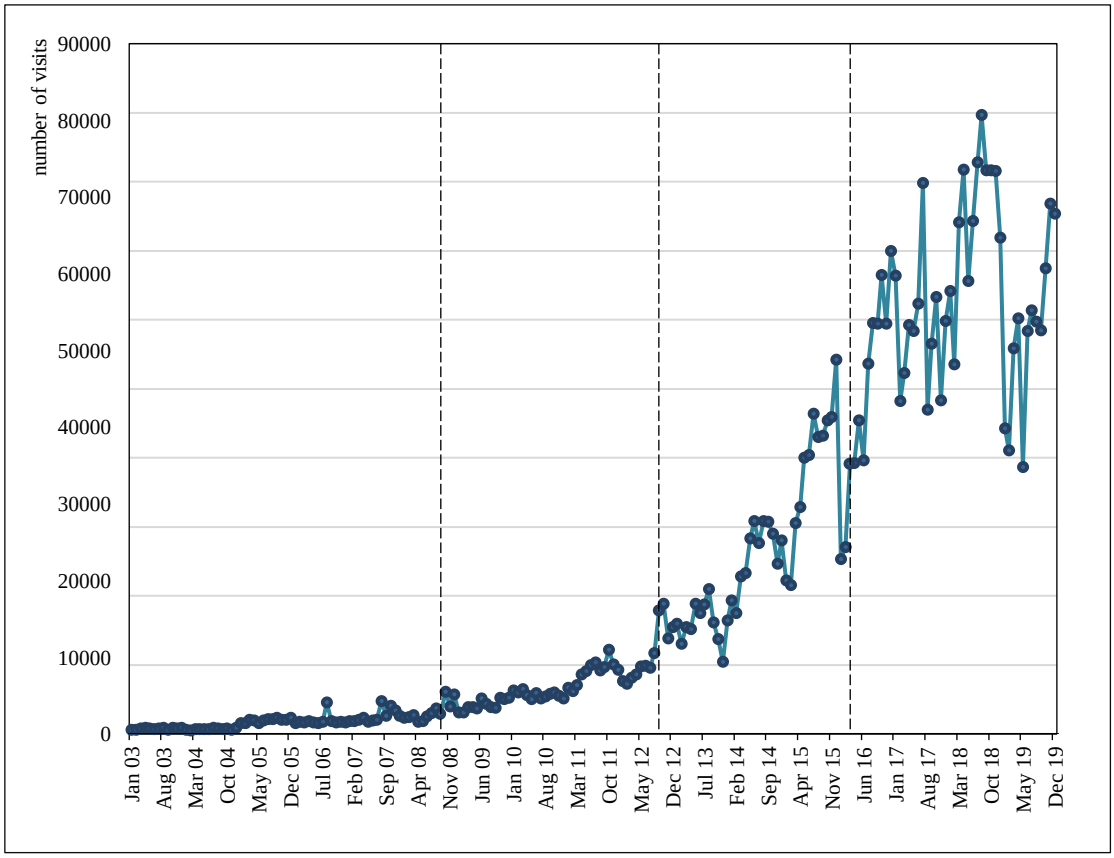

Figure 2. The development of the number of tourist visits to Belitung Island for the monthly period, 2003-2019 (Belitung and East Belitung Tourism Office)

Figure 2 shows that tourist visits to Belitung Island prior to the *Laskar Pelangi* film in September 2008 tended to be constant and grew very slowly. The number of tourists visiting Belitung Island every month during that time was never more than 5,000 people. More consistent growth was shown after *Laskar Pelangi* was released in theatres. In this condition, the *Laskar Pelangi* film shows an indication of intervention in tourist visits to Belitung Island. The number of tourists visiting Belitung Island following

the construction of the Kata Museum in September 2012 also tended to grow drastically, indicating another intervention to the tourist arrival. Tourism in Belitung continues to grow and has become the government's attention. After Tanjung Kelayang was designated as a Tourism SEZ in March 2016, the number of tourist visits in this period was more volatile. The central government's intervention has resulted in more policies and factors on a national level affecting tourist visits to Belitung.

3.1 ARIMA Intervention modelling

ARIMA Intervention modelling begins with the formation of a pre-intervention ARIMA model. This model estimates tourist visits to Belitung Island in a situation that is assumed to be unaffected by film tourism. ARIMA Pre-intervention modelling includes model identification, parameter estimation and residual diagnostic testing. Previously, the Box-Cox test was conducted. It resulted in the tourist visit data having a variance that was not constant, so it was necessary to carry out the Box-Cox transformation, namely the square of the natural logarithm.

$$Y_t = \ln(tourist\ visits_t)^2 \quad (5)$$

After the transformation is carried out, then the ADF test can be done. ADF test results on the first differencing data showed a p-value of 0.0000. With α of 5 percent, it can be stated that the first difference Y_t has been stationary. Furthermore, several ARIMA models have been identified based on ACF and PACF plots and consideration of the importance of seasonal elements in tourism (Cantis and Ferrante; 2011). After estimating the parameters and testing the diagnosis with α of 5 percent, there is only one model that fulfils the two diagnostic tests. namely $SARIMA\ (0,1,0)(0,1,1)_{12}$. It was a seasonal ARIMA model with a lag period of 12, showing the effect of a monthly pattern in a year. Estimated parameters and diagnostic testing models $SARIMA\ (0,1,0)(0,1,1)_{12}$are shown in Table 1.

Table 1: Parameter estimation and diagnostic testing of the pre-intervention ARIMA model

Parameter		Ljung Box test		Kolmogorov Smirnov test	
Coefficient	p-value	Lag	p-value	D	p-value
(1)	(2)	(3)	(4)	(5)	(6)
Θ_1 = 0,80515	<0,0001	6	0,3768	0,112842	0,0805
		12	0,6934		
		18	0,5841		
		24	0,0637		

Based on the stages of model identification and residual diagnosis testing, the selected pre-intervention ARIMA model was $SARIMA\ (0,1,0)(0,1,1)_{12}$. The RMSE of the model is 4.22186. The pre-intervention ARIMA Model equation can be written as follows:

$$Y_t = \frac{(1 - 0{,}80515B^{12})e_t}{(1-B)(1-B^{12})} \quad (6)$$

Forecasting was carried out using the pre-intervention model for the first intervention period. The difference between these two values forms a residual that can be used in the identification of intervention orders. A plot was formed based on the residual value with a limit of ± 2 times the RMSE value of the pre-intervention model.

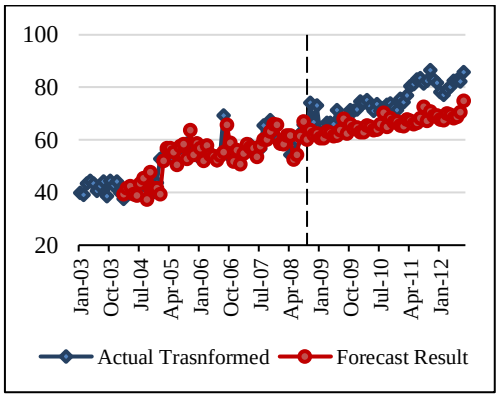

Figure 3. Forecasting results from the pre-intervention model

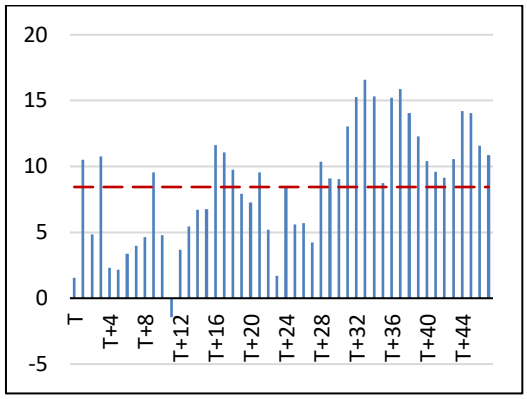

Figure 4. The residual value since T_1

T_1 in the first intervention variable is the month of the release of *Laskar Pelangi*, September 2008. Figure 3 shows that the pre-intervention model's prediction does not fit with the actual data of the first intervention. Figure 4 shows that the residual value for the first time exceeds 2 times the RMSE is at T_1+1, or one month after the release of the *Laskar Pelangi* film period. Thus, there is a possibility that the value of order b is 1. Based on the parameter estimate with α of 5 percent, the order of the first intervention is obtained, namely b = 1, s = 0, and r = 1. Diagnostic testing is carried out on this model, and the results show that the residuals are independent and normally distributed. The first ARIMA intervention model can be written as follows:

$$Y_t = \frac{(9{,}61441)B^1 S1_t}{(1 + 0{,}72647B)} + \frac{(1 - 0{,}79865B^{12})e_t}{(1 - B)(1 - B^{12})} \quad (7)$$

Where $S1$ is the first intervention variable, the *Laskar Pelangi* film which began circulating in theatres in September 2008. Order b in this model shows that the effect of the intervention can be felt significantly starting the following month, October 2008. This shows that the influence of the tourism phenomenon from the *Laskar Pelangi* film is felt directly or instantaneously. The existence of this influence tends to be permanent.

After the first intervention model is formed, forecasting is carried out on the data for the second intervention period and calculating the residuals. T_2 in the second intervention was the month when the Kata Museum was opened in September 2012. Then, a plot was formed based on the residual value with a limit of ± 2 × RMSE for the first intervention model.

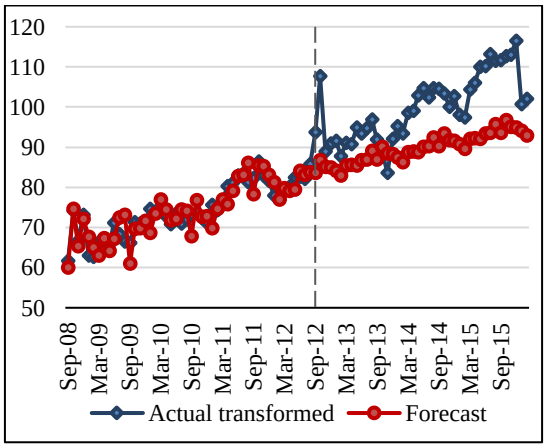

Figure 5. Forecasting results from the second intervention model

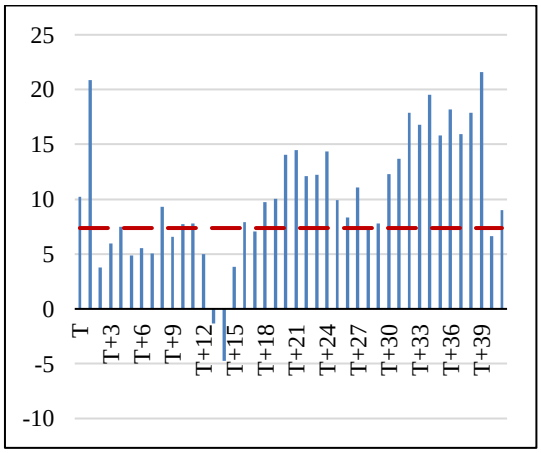

Figure 6. The residual value since T_2

Figure 5 shows that the first intervention model's prediction does not fit the second intervention actual data. Figure 6 shows the residual value in period T_2 itself has exceeded two times the RMSE in the same month, the Kata Museum was opened. This indicates that the order b in the second intervention is zero. With α of 5 percent in estimating the parameters, the order of the second intervention is b = 1, s = 1,2,40, and r = 0. Diagnostic testing is carried out on this model, and the results show that the residuals are independent and normally distributed. The second intervention ARIMA model can be written as follows:

$$Y_t = \frac{(9{,}62478)B^1 S1_t}{(1 + 0{,}75473B)} + (9{,}36943 + 13{,}33903B^1 - 15{,}26133B^2 - 13{,}25904B^{40})B^0 S2_t + \frac{(1 - 0{,}30000B^{12})e_t}{(1 - B)(1 - B^{12})} \quad (8)$$

The second ARIMA intervention model shows that the effect of the Kata Museum establishment is felt directly (instantaneously) in the same month that the museum was opened, namely September 2012. Then, this influence drastically strengthened in the following month, October 2012 but weakened again in November 2012. Temporary drastic increase in October 2012 suggests that other factors exacerbate this influence. According to the East Belitung Culture and Tourism Office, this is due to the 2012 Sail Indonesia activity because Manggar City is a stopover point. In addition, the East Belitung Fashion Carnival was held for the first time in October 2012.

After the second intervention model was formed, forecasting was carried out on the data for the third intervention period and calculating the residuals. T_3 in the third intervention was March 2016 where Tanjung Lesung was designated as a Tourism SEZ. Then, a plot was formed based on the residual value with a limit of ± 2 × RMSE for the second intervention model.

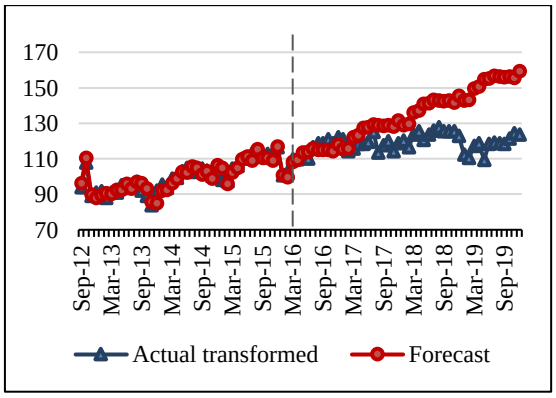

Figure 7. Forecasting results from the third intervention model

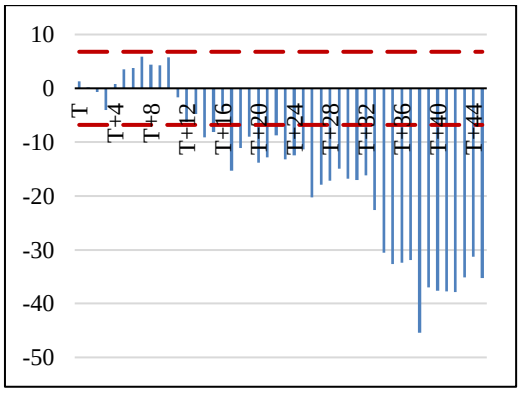

Figure 8. The residual value since T_3

Figure 7 shows that the second intervention model's prediction does not fit the third intervention actual data. Figure 8 shows that the residual value has begun to approach the ± 2 × RMSE limit for a long time since the T_3 period, namely from the T_3+6 to T_3+10 periods, as well as T_3+12 and so on. With α of 5 percent in estimating parameters, after trial and error, the significant order of third intervention was obtained, namely b = 10, s = 7,12,18, and r = 1. This result shows that the effect of this third intervention was only recorded 10 months after the event of the intervention, with instability in the following months based on the s orders result. Diagnostic testing is carried out on this model, and the results show that the residuals are independent and normally distributed. The third intervention ARIMA model can be written as follows:

$$Y_t = \frac{(9{,}65088)B^1 S1_t}{(1+0{,}75387B)} + (9{,}35857 + 13{,}30274B^1 - 15{,}30274B^2 - 10{,}65985B^{40})B^0 S2_t + \frac{(6{,}28573 - 12{,}84982B^7 + 9{,}59503B^{12} - 17{,}64057B^{28})B^{10} S3_t}{(1+0{,}28530B)} + \frac{(1-0{,}30689B^{12})e_t}{(1-B)(1-B^{12})} \quad (9)$$

The third ARIMA intervention model shows that the effect of the Tanjung Kelayang Tourism SEZ was significant ten months after it was established in January 2017. This explains that the determination of SEZ cannot have a direct effect but requires time and process in the framework of infrastructure and facility development through incentives, specifically, as regulated in law. This influence was felt to weaken starting in August 2017. The number of tourist visits to Belitung Island after this third intervention showed more fluctuation in a certain time since the Tourism SEZ was established. This means that the SEZ creates more factors affecting tourism activity on the Belitung Island. Because it is a central government policy, the impact may be at a national level and affect Belitung tourism. One of them is the regulation of airline ticket prices. According to the information from the Belitung Regency Culture and Tourism Office, the increase in the price of airline tickets to Belitung reduced the frequency of flights to Belitung Island due to decreased tourist interest. The expensive cost of tickets and transport gave an initial negative impression to some tourists (Ibrahim et al., 2019).

3.2 Measuring the Film Tourism Effect

The result of estimation in the form of transformation cannot be used directly to calculate the magnitude of the effect because it has a different scale. Data needs to be returned to its true scale to calculate the magnitude of the influence (Lee et al., 2011).

$$\widehat{\text{tourist visits}}_t = \exp\left(\sqrt{\widehat{Y}_t}\right) \quad (10)$$

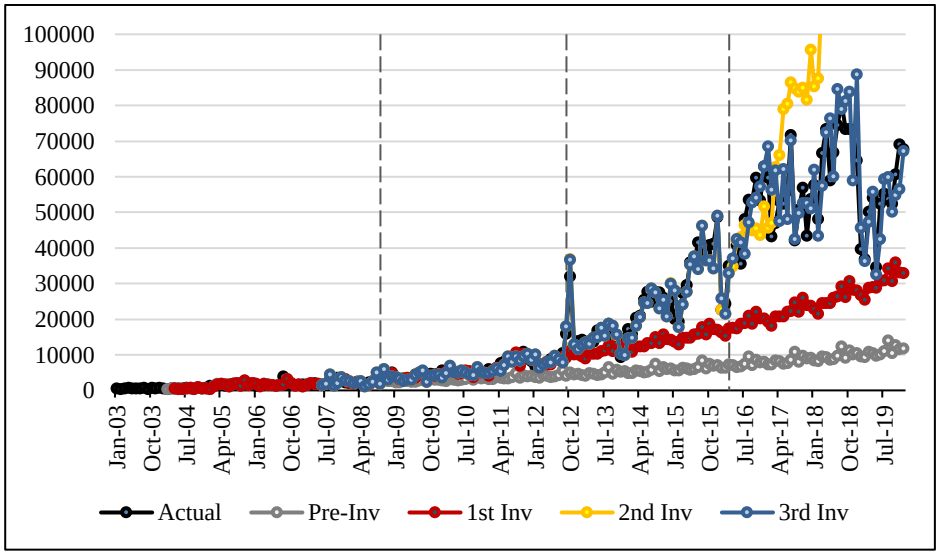

Figure 9. Estimation results and actual data on tourist visits to Belitung Island

Based on Figure 9, it can be seen that the release of the *Laskar Pelangi* film and the construction of the Kata Museum, in general, increased the number of tourist arrivals. This indicates that there was a contribution from the tourism film phenomenon in the *Laskar Pelangi* film and Kata Museum as destinations related to the film. Meanwhile, the Tanjung Kelayang SEZ in Belitung Regency also attracts a number of tourists visits even though there is a delay since its establishment due to high ticket prices and limited number of flights. Regrettably, the increase in airline ticket prices decreases the frequency of flights to Belitung because of declining interest in tourists to continue visiting Belitung Island. Furthermore, transportation issues, limited facilities in the tourist destination, and environmental damage are still problematic and leave a negative impression on Bangka Belitung (Ibrahim et al., 2019).

The phenomenon of film tourism until the end of the research period still shows its existence. The effect of the *Laskar Pelangi* film on tourist visits to Belitung Island was first felt one month later, in October 2008. It was found that the *Laskar Pelangi* film succeeded in increasing the number of tourist visits to Belitung Island to 2,770 visits or reaching 105.61 per cent compared to without intervention in October 2008. The influence of the Kata Museum intervention was felt in September 2012 when the museum opened, reaching 8,663 visits or 92.64 percent increase compared to without intervention. The effect of the Tanjung Kelayang SEZ in March 2016 on tourist visits to Belitung Island was significantly felt only in January 2017, an increase of 22,765 visits compared to without intervention, or by 49.66 percent. More influence changes occurred in the third intervention period, August 2017, January 2018, and May 2019, declining to 42,332 visits, 23,406 visits and 219,784 visits, respectively. The overall comparison based on modelling results for each intervention in estimating the number of tourist arrivals can be seen as follows:

Table 2: The impact of interventions to the tourist visits to Belitung Island

Period		Estimation results of the pre-intervention model	Estimation results of the pre-intervention model	Magnitude of impact	
(1)	(2)	(2)	(3)	(4)	(5)
First Intervention (T_1) = *Laskar Pelangi* Film					
T_1+1	Oct-2008	2.907	5.977	3.070	+105.61%
Second Intervention (T_2) = Gallery of *Laskar Pelangi* or Kata Museum					
T_2+0	Sep-2012	9,326	17,966	8,640	+92.64%
T_2+1	Oct-2012	11,145	36,850	25,705	+230.64%
T_2+2	Nov-2012	10,169	12,971	2,802	+27.55%
T_2+40	Jan-2016	16,293	25,994	9,701	+59.54%
Third Intervention (T_3) = Tanjung Kelayang SEZ					
T_3+10	Jan-2017	45,839	68,604	22,765	+49.66%
T_3+17	Aug-2017	84,915	42,583	-42,332	-49.85%
T_3+22	Jan-2018	85,474	62,068	-23,406	-27.38%
T_3+38	May-2019	252,349	32,565	-219,784	-87.10%

Conclusions

Based on the analysis conducted in this study, several conclusions can be drawn. In general, tourist visits to Belitung Island proliferated from 2003 to 2019, with fluctuations in certain periods. Based on the intervention model, the *Laskar Pelangi* film and the Kata Museum of Andrea Hirata have a significant direct effect on the tourist arrival to Belitung Island. Meanwhile, the influence of the Tanjung Kelayang Tourism SEZ was only felt significant almost one year after it was established. This shows that the film tourism phenomenon has a faster impact, and it is possible to become a new form of innovation that is effective as a catalyst for the future of Indonesia's tourism sector.

The creative economy actors in the film sub-sector are encouraged to partner with the government through the Ministry of Tourism and Creative Economy to create and utilize tourism films by making more regional-tourism-development-oriented films. This has the potential to give birth to new tourist areas with more diverse attractions. Local governments should take advantage of the film tourism phenomenon featuring their regions by building destinations related to the film as commercialization.

Any attention must be paid to developing the infrastructure and facilities around the destination. The government also needs to be careful in making further policies that will impact rising prices in the region, especially travel, accommodation, food and beverages, which can affect the interest of tourists. Future studies could explore other topics of film and tourism in other cases to identify the existence of the phenomenon of film tourism.

Acknowledgements

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Research Paper

Business Model Innovation in Research and Development: State of the Art and Based on Public Needs

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ABSTRACT

Every institution has business models, but some are not properly realized to benefit and meet the public needs. The aim of the study was to improve the government's existing business models in space technology to meet the public needs. Related studies regarding the issues were reviewed, and personal observation was conducted at the government space institution in Indonesia. The study found that to attain the public needs, the development of the business model in space technology should consider four aspects, research and development expenditures, wellbeing, sustainable cities and communities, and adoption of emerging technologies. Incorporating the four aspects into the existing business model is expected to bring the research and development closer to what the public wants.

Keywords: business model innovation, public needs, research and development, space technology institution

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1. Introduction

Innovation in business models, especially related to technology, has been widely discussed in previous studies, such as by Chesbrough (2007a), Gambardella and McGahan (2010) and Spieth et al. (2014). Business models have become a very important tool for financial institutions to "commercialize new ideas and technologies" (Chesbrough, 2010). Every institution has a business model, but not all are well materialized into "profitable" activities. This also happens to national institutions, especially in research and development in Indonesia. Government's interests are interpreted when all efforts made by the agency are in line with public needs while the public interest is steadily increasing. Activities carried out at these institutions often do not address the public needs because the businesses are not carried out according to the community's needs. This was reported in the study by Dutta & Lanvin (2020), who explained that Indonesia, especially on the people pillar, second sub pillar: businesses, R&D expenditure by businesses, is in the 81st position out of 134 countries in the world. This also affect impact pillar, especially on the sub pillar number 3, SDG contribution about SDG 3: Good Health and Wellbeing, which is still stranded in the 101st (in 2020, and 99th of 130 in 2021) of the world ranking and SDG 11 Sustainable Cities and Communities which is also still in the 45th (in 2020, and 52nd of 130 in 2021) of the world ranking.

Furthermore, it is also mentioned that Indonesia's value for adopting emerging technologies is still at the level of 4.04 or ranked 41st globally. The highlight of the application of technology and its impact on SDG achievement has also been reviewed by Pratistha (2018). The study suggested that the readiness of institutions in Indonesia to run their business must be improved in the way of explaining the business, running the business, and developing the business. These three elements were also mentioned in a study made by Spieth et al. (2014). They found that the need to increase connectivity should be directed to the fragmented communities in the innovation business model.

Table 1. The Network Readiness Index in Detail

Indicator	Rank and Score		
	2019 (Rank /121)	2020 (Rank /134)	2021 (Rank /130)
A. Technology pillar			
1st sub-pillar: Access			
Mobile tariffs	64 and 63,58	64 and 63,58	58 and 63.09
Handset prices	72 and 42.05	72 and 42.05	96 and 37.87
Households with internet access	68 and 63.96	70 and 66.13	61 and 78.27
SMS sent by population 15-69	-	-	11 and 87.86
Population covered by at least a 3G mobile network	-	-	74 and 99.38
4G mobile network coverage	61 and 92,70	62 and 92.70	-
Fixed-broadband subscriptions	71 and 48.04	73 and 48.04	-
International Internet bandwidth	75 and 66.84	76 and 66.91	1 and 100.00
Internet access in schools	-	-	-
2nd sub-pillar: Content			
Digital participation and content creation	-	-	
GitHub commits	-	88 and 1.68	87 and 1.52
Wikipedia edits	-	91 and 27.98	96 and 30.51
Internet domain registrations	-	-	-
Intellectual property receipts	75 and 0,16	-	-
AI scientific publications	-	-	18 and 66.91
Mobile apps development	81 and 49.79	85 and 54.47	85 and 67.98
3rd sub-pillar: Future Technologies			
Availability of the latest technologies	65 and 52,56	-	-
Adoption of emerging technologies	-	41 and 59.47	41 and 59.47
Government procurement of advanced technology products	12 and 69,87	-	-
Investment in emerging technology	28 and 59,63	28 and 62.78	28 and 62.78
ICT PCT patent applications	79 and 0,16	81 and 0.06	-

Indicator	Rank and Score		
	2019 (Rank /121)	2020 (Rank /134)	2021 (Rank /130)
Computer software spending	30 and 27,27	32 and 29.17	27 and 31.83
Robot density	47 and 1,56	47 and 1.56	49 and 1.33
B. People pillar			
1st sub-pillar: Individuals			
Internet users	96 and 33,37	100 and 38.28	-
Active mobile-broadband subscriptions	50 and 33,30	50 and 33.85	5 and 91.73
Use of virtual social networks	58 and 55,30	55 and 58.76	76 and 61.33
Tertiary enrollment	73 and 26,14	74 and 26.14	77 and 24.99
Adult literacy rate	43 and 93,31	43 and 94.44	41 and 94.44
ICT skills	53 and 20,07	49 and 60.88	41 and 49.98
2nd sub-pillar: Businesses			
Firms with website	108 and 2,47	115 and 12.77	111 and 12.73
GERD financed by business enterprise	-	-	80 and 9.81
Annual investment in telecommunication services	-	-	13 and 88.2
GERD performed by business enterprise	-	-	82 and 0.24
Internet Shopping	68 and 12,64	-	-
Ease of doing business	66 and 69,60	68 and 69.60	-
Professionals	115 and 1,14	99 and 13.78	101 and 13.84
Technicians and associate professionals	77 and 25,70	106 and 12.63	108 and 11.66
The extent of staff training	28 and 64,35	-	-
Business use of digital tools	-	35 and 75.86	-
R&D expenditure by businesses	77 and 0,54	81 and 0.42	-
3rd sub-pillar: Governments			
Government online services	90 and 52,30	71 and 67.28	70 and 67.28
Publication and use of open data	38 and 38,35	38 and 38.35	38 and 38.18
ICT use and government efficiency	28 and 63,27	-	-
Government promotion of investment in emerging technologies	-	24 and 60.62	24 and 60.59
R&D expenditure by governments and higher education	75 and 17,79	72 and 21.25	72 and 21.25
C. Governance pillar			
1st sub-pillar: Trust			
Rule of Law	79 and 46,15	-	-
Software piracy rate	93 and 8,11	-	-
Online trust and safety	3 and 93,00	-	-
Secure Internet servers	61 and 61,06	60 and 59.28	58 and 60.15
Cybersecurity	43 and 83,00	43 and 83.21	31 and 94.79
Online access to the financial account	-	94 and 14.96	91 and 14.96
Internet shopping	-	69 and 12.64	67 and 12.64
2nd sub-pillar: Regulation			
Regulatory quality	75 and 49,84	76 and 49.84	75 and 38.58
ICT regulatory environment	90 and 71,24	95 and 71.24	121 and 56.47
Legal framework's adaptability to emerging technologies	27 and 69,60	36 and 55.08	36 and 55.08
E-commerce legislation	1 and 100,00	1 and 100.00	1 and 100.00
Social safety net protection	41 and 56,11	-	-
Privacy protection by law content	-	65 and 34.22	91 and 56.29
3rd sub-pillar: Inclusion			
E-Participation	86 and 56,69	56 and 74.07	56 and 74.07
The socioeconomic gap in the use of digital payments	97 and 41,34	105 and 41.34	101 and 28.66
Availability of local online content	45 and 62,23	45 and 70.21	45 and 70.21
The gender gap in internet use	75 and 46,91	78 and 46.95	80 and 48.52
The rural gap in use of digital payments	57 and 69,30	60 and 69.30	58 and 69.30
D. Impact pillar			

Indicator	Rank and Score		
	2019 (Rank /121)	2020 (Rank /134)	2021 (Rank /130)
1st sub-pillar: Economy			
High tech and Medium-high-tech industry	40 and 44.72	40 and 44.72	41 and 39.92
High-tech exports	56 and 15.19	60 and 15.19	46 and 38.17
PCT patent applications	86 and 0,01	86 and 0.01	94 and 5.71
The growth rate of GDP per person engaged	-	-	34 and 66.73
ICT services exports	-	-	93 and 14.48
Labour productivity per employee	76 and 15,60	85 and 15.38	-
Prevalence of gig economy	-	16 and 73.20	16 and 73.20
2nd sub-pillar: Quality of Life			
Happiness	75 and 47,55	83 and 52.15	82 and 46.24
Freedom to make life choices	36 and 81,23	49 and 83.45	47 and 83.27
Income inequality	66 and 65,53	72 and 61.86	66 and 64.58
Healthy life expectancy at birth	93 and 46,89	97 and 50.97	92 and 62.27
3rd sub-pillar: SDG Contribution			
Access to basic services	95 and 75,25	-	-
Pollution	42 and 88,89	-	-
Road safety	48 and 70,31	-	-
Reading proficiency in schools	42 and 66,42	-	-
Maths proficiency in schools	62 and 15,93	-	-
Use of clean fuels and technology	87 and 66,67	-	-
Good Health and Well-Being	-	101 and 47.54	99 and 47.54
Quality Education	-	72 and 20.12	70 and 19.51
Gender Equality	-	93 and 64.22	-
Affordable and Clean Energy	-	33 and 86.20	35 and 83.71
Females employed with advanced degrees	-	-	86 and 20.58
Sustainable Cities and Communities	-	45 and 75.94	52 and 85.16

Source: Network Readiness Index

Table 1 above reports the network preparation index for the cost of research and development in business, happiness, sustainable city and community. The application of Emerging technology is also important notes in previous studies. For example, Egger et al. (2012) stressed that research and development expenditures have been significant to ASEAN countries' economic growth and happiness. However, the failure of a research and development project is a common and scary issue in innovation processes and causes significant damage to companies (Cheng and Chen, 2011). Secondly, it is very important for countries where most research and development activities are still dominated by the country (more than 90%), such as Indonesia, to create a system to resolve and protect the industry that wants to allocate some of its money for research and development activities. Another aspect recognized in previous studies is also linked to sustainable cities and communities. The community also plays an important role. This is enhanced by a study conducted by Pratistha (2019), explaining that consumers are part of the community as intermediary manufacturers. They have the opportunity to determine the optimal market. Community aspects become very important here. Later, the association with sustainable cities was also the main topic of Stratigea et al.'s (2019) research, The study associated urban and happy environments. They also explain that reasonable indicators must be compiled to support decision-making planners and plans. Cities and sustainable communities are obviously a public demand (Höjer and Wangel, 2015; Cloutier et al., 2014). Another aspect of public needs is that emerging technologies are still deficient, especially in small and medium enterprises (Beekhuyzen et al., 2005). The public has limited access to technology (Mejias et al., 1997), which often occurs in emerging economic countries, such as Indonesia (Ejiaku, 2014), so the model should be changed (Newman et al., 2012) and begins from the Gil-Garcia et al. (2014) model.

The concept presented in this study refers to a business model that leads to public needs so that Research and Development expenditures, wellbeing, sustainable cities and communities, and adoption of emerging technologies can improve the business model implemented by institutions engaged in research and development (Agostini et al., 2020; Latronico and Pellegrini, 2019). Indeed, this cannot be separated

from existing resources that must be optimized and increased. The sharpening of the business model related to the four elements that manifest the public needs becomes state of the art in this study. No studies explain the application of these four elements simultaneously to produce the formulation of the forming elements in the business model.

Previous literature reviews on business models have attempted to categorize business model innovation research in different ways. Morris et al. (2005) defined three general categories related to economic, operational and strategic. Furthermore, Zott et al. (2011) focused their study area on e-business and the use of information technology, strategic issues, and innovation and technology management. Perkmann and Spicer (2010) found that transactional structures, value extracting devices and mechanisms for organizational structuring are the dominant business model conceptions. Demil and Lecocq (2010) explained the difference between static and transformational approaches to the business model concept. George and Bock (2011) also took the initiative to cluster them into six broad themes: organizational design, resource-based view, narrative and sensemaking, innovation, opportunity, and transactive structures. Furthermore, Schneider and Spieth (2013) categorize existing literature on business model innovation into three streams of research: (1) prerequisites of conducting business model innovation, (2) elements and processes of business model innovation, and (3) effects achieved through business innovation models. Spieth et al. (2014) also clustered roles into three things, (1) explaining the business, (2) running the business and (3) developing the business.

Table 1: Roles and Respective Categories of Business Model Definitions

Role	Associated terms	Authors (examples)
R&D expenditure by businesses	Applied Research	Coccia (2008)
	Financial Risks	Hill (1969)
	Grants and Procurement	Coccia (2011)
	Strategic Orientation	Engel et al. (2016)
	Business Innovation and Inventions	Huňady and Pisár (2021)
	Specialization	Guellec and van Pottelsberghe de la Potterie (2003)
Wellbeing	Achievement	Bass (1999); La Guardia, et al. (2000)
	Self-actualization	Bass (1999)
	The organization	Bass (1999), Dodge et al. (2012)
	Self-interest	Bass (1999); La Guardia et al. (2000)
	Individual preference	Ferrer-i-carbonell (2005)
	Survival	Bass (1999)
Sustainable cities and communities	Synergies	Bai et al. (2016)
	Inclusivity	Bai et al. (2016)
	Social-ecological–technological systems	McPhearson et al. (2016)
Adoption of emerging technologies	Limited resources	Amos (1982)
	Innovative and knowledgeable about IT	Beekhuyzen et al. (2005)
	Quality of access to suppliers of technology-related services	Scupola (2003)
	Government intervention	Scupola (2003)
	Pressure from buyers	Scupola (2003)
	Suppliers and competitors	Scupola (2003)
	Manager characteristics	Harker and Van Akkeren's (2002)
	Return on Investment (ROI)	Harker and Van Akkeren's (2002)
	Firm characteristics	Harker and Van Akkeren's (2002)

Research and development expenditures subjected to such volatility are more challenging to manage and control. The mismanagement of R&D projects can lead to situations in which R&D projects continue to absorb resources without ever delivering the intended benefits (Cheng and Chen, 2011). R&D Expenditure's actors here are public and private (Coccia, 2008; Rakhel et al., 2021). One study also explains that one dollar of direct government funding to business generates a $0.70 marginal increase in business-funded R&D – $1.70 in total R&D (Guellec and van Pottelsberghe de la Potterie, 2003). The impact is even felt in industries related to chemicals, electronic components and communications equipment, electrical equipment and office machines in emerging countries (David et al., 2000; Falk, 2004; Szarowská, 2017). Thus, it is obvious that R&D has an impact in all aspects and is highly oriented to public needs because it also contains elements of wellbeing (Campbell and Guttel, 2005). Also, there are consequences for business innovation and inventions (Huňady and Pisár, 2021).

Campbell and Guttel (2005) and Bass (1999) explained the wellbeing aspect. They found that the wellbeing is closely related to achievement, self-actualization, the organization, self-interest, and survival. One of them is influenced by R&D activity. Greater security in people's general attachment has been

associated with greater wellbeing (La Guardia et al., 2000). They also argued that wellbeing is synonymous with meeting needs. Another study also found that wellbeing depends on the individual's income and the income of the reference group. The reference group can include all members of a society or only a subgroup (Ferrer-i-Carbonell, 2005).

The smart city concept has been largely conceived as a new ICT-enabled approach for sustainable urban development and is constantly gaining popularity among various cities around the globe (Komninos et al., 2016). The sustainable development of cities (and communities) is increasingly recognized as crucial to meeting collectively agreed sustainability goals at local, regional and global scales and, more broadly, secure human wellbeing worldwide (Bai et al., 2016). Synergies and inclusivity are needed. Furthermore, a systems approach is economically sustainable as it is inclusive of different types and a wider range of economic values attached to goods and services provided by urban system functions. A systems approach begins with a sound understanding of the genesis of current systems, social structure, economic, ecological, political, and dynamics within and beyond the city (Bai et al., 2016; McPhearson et al., 2016). Solutions derived from the systems approach are not fixed in time or space but need to be flexible to account for new challenges and opportunities (Leichenko, 2011).

Some new challenges and opportunities that affect sustainability are closely related to technology and the implementation of innovation. Thus, the application of technology and innovation must be in line and ensure the sustainable development city (McPhearson et al., 2016). Furthermore, their study also emphasizes the influence of technology and innovation on sustainable communities. Communities become a very crucial factor. Power (2004) found that the sustainable community plan tackles main issues like the need for higher quality homes set in safe and attractive neighbourhood environments. Government's R&D activities have the potential to cause air and noise pollution. For this reason, it is necessary to make remote areas the central locations for R&D activities, especially the sensitive technology testing. The government should make communities central to its overall growth and development strategy. Power (2004) also found that there are four essential measures of building blocks for sustainable communities. 1) Planning, design, density and layout will influence the shape of a community, the level of services and the way people interact with each other and their environment; 2) minimizing energy use and environmental impact contributes to sustainability, helps combat global warming and encourages 'long-term stewardship of' communities; 3) a viable local economy and services provide the rationale and underpinning for community development and survival; 4) community organization and neighbourhood management are essential to social networks and urban viability, ensuring well maintained, safe conditions which are the prerequisite of stable, long-term, participative and cohesive communities.

Technology adoption is affected by several factors, often being influenced by at least one (and often many) of the factors presented by MacGregor et al. (1998). The factors include limited resources (Amos, 1982), innovation and knowledge about IT (Beekhuyzen et al., 2005), quality of access to suppliers of technology-related services, government intervention, pressure from buyers, suppliers and competitors (Scupola, 2003), and manager characteristics, Return on Investment (ROI), Firm characteristics (Harker and Van Akkeren, 2002). Steers et al. (2008) found that local culture will be another challenge in technology adoption. They also explained that technology is both powerful and prospective, and nations that shy away from widespread technology adoption often curtail their national competitiveness and their standard of living.

Other components can be considered to make the company profile complete in the business model. These other components are complementary to the previous literature review. The theory presented by Spieth et al. (2014) is part of the big picture of the business model, especially regarding the value proposition. However, other components that should be included in the business model besides the value proposition are key partners, key resources, cost structures, revenue streams, channelling, customers, main activities, and products. The business model becomes more oriented towards innovation and sustainability by sharpening the value proposition (Spieth et al., 2014).

2. Methodology

This study aims to construct theory by forming the necessary elements to build a business model based on public needs. The outcome of this study can answer the need to improve the business model commonly used in research and development institutions in Indonesia, especially in space technology

institutions. The unit of analysis in this study includes the space technology institution, while the unit of observation is the management. This study uses a literature review to build a theoretical framework based on a business model on the issue of innovation. The primary literature in this study comes from the gaps in the results obtained from Spieth et al. (2014) study, especially on how to run a business. The study found that the need for a stakeholder perspective and exploratory innovation or exploitative innovation in a business model canvas also explains organizational design and values.

Furthermore, after the literature review, the author also conducted secondary data mining to present benchmarking for applying business model innovation carried out by four similar institutions abroad. To validate the results, the author also made observations. Observation is an activity of observing the company's activities related to the problem being researched, especially concerning the studied variables, by conducting direct observations to obtain more accurate information. Creswell (2014) explains that observation is very good for identifying the unit of analysis used as the object of research. The closeness of a researcher with his unit of analysis can be an advantage in subjectively justifying the images captured through his five senses. In this study, observations were made on a small part of the use of Indonesian space research and development products. This study was carried out in stages in the form of an overlay process between secondary data and theory that can complement each other to provide complete information to the research object.

3. Results and Discussions

The current business model innovation focuses on research and development, creating the regulation, giving products and services, and customer relationships (Aeronautics and Space Research Organization [LAPAN], 2020). These four aspects have so far provided evidence of an impact on national development (but only for fellow government agencies and have not had a direct impact on end-users, in this case, the community), such as agriculture, forestry, finance, marine, energy, transportation, defence sectors, security, social, industrial, education, public works, and tourism. The role of space technology in the agricultural sector can be seen from a technological solution in the form of LAPAN Surveillance Unmanned (LSU) Drone Precision Farming which helps overcome the nation's problems, especially related to seed distribution and spraying of plant pests. The presence of LSU Drone Precision Farming is also able to answer issues related to the decline in labour interest in the agricultural sector so that the limited workforce can be replaced with technology and crop yields from agriculture remain optimal. Furthermore, the information provided from the processing of remote sensing data and space and atmospheric science data can help the planting and harvesting periods so that precision and the cycle of work processes to fertilizer distribution becomes better. In the forestry sector, Indonesia currently has a key technology in the form of very high-resolution image data[1]. It can assist the decision-making process regarding the quality of forest plants. Space technology can provide information support related to finance, such as calculating potential state tax revenues, which has been ongoing since 2013. Space technology has also contributed to the energy sector (through remote sensing information) to increase the electrification ratio and distribute electricity to villages that are yet to get electricity, such as in Eastern Indonesia. Furthermore, space technology also plays a role in transportation, such as research related to decision-making systems on aviation and navigation safety and innovative products such as N-219 and N-219A to ensure connectivity between remote islands with runways. The manned aircraft technology is also expected to fulfil passenger seat capacity and accommodate the increase in domestic and foreign tourist traffic.

Space technology also contributes to defence and security sectors such as decision-making systems for radio communications, remote sensing satellite imagery, rocket technology for special uses, LAPAN-A2, A3, and A4 satellite-based monitoring. These technologies support the national defence system from land, sea, and air crimes. Space technology also assists the social sector, where remote sensing data and drones have provided solutions to help map poverty areas, environmental conditions for poor families, and the potential that can be developed. In the industrial sector, designing and building space technology has also stimulated the growth of related industries such as manned and unmanned aircraft components, rocket raw materials, and remote sensing data and information processing industries. Its design process also stimulates the growing interest and potential of the education sector

[1] Procurement of national remote sensing image data through one door policy through LAPAN can increase cost efficiency up to 12 Trillion Rupiah/Year (Center for aeronautics and space policy studies (Puskkpa, LAPAN) (2017)

through work schemes based on work breakdown structures to technical cooperation in the Academy, Business, and Government (ABG). Another sector that also feels the impact of space technology is public works, where the implementation and performance of almost all national strategic infrastructure projects can be monitored through remote sensing satellite imagery, both high and very high resolution. Furthermore, another development sector (but not the last) is tourism, the spirit of space tourism based on local economy and culture continues to be explored and is now entering into several more concrete projects, one of which is the construction of a national observatory in East Nusa Tenggara, which is expected to grow the interest of domestic and foreign tourists to travel based on space information (for example, dark skies at night). In addition, national space technology also plays a role in efforts to reduce the impact of losses due to natural disasters through a disaster early warning system. At least, this is what continues to be a concern for stakeholders nationally.

LAPAN (which is integrated into the National Research and Innovation Agency (BRIN)) as one of the institutions involved is currently focused on efforts to produce low orbit communication satellites that will be operational in the full constellation by 2024. Significantly, the contribution of this technology will accelerate the dissemination of information in the event of a disaster from 5 minutes to 3 minutes, and the economic value of this project can save foreign exchange costs for satellite communications of no less than 121 million USD per year. Space technologies also help mitigate and deal with disaster impacts through remote sensing data to monitor hotspots during forest and land fires and the health of lake, coastal and marine resources. Data and information that is no less important is the monitoring of space objects through space science data and information, which also plays a role in efforts to mitigate disasters from outer space such as the solar storm that occurred in 2012. Table 2 below describes the comparison of business model innovation in similar institutions.

Table 2. The Comparison of the Application of Business Model Innovation in Similar Institutions

No.	Institution	Application of Business Model Innovation
1.	Indian Space Research Organization (ISRO)	ISRO applies innovation to the business model by including it in the value proposition that allows them to satisfy a specific need for a specific user. Furthermore, they also place strategic partnerships into value creation and share value with stakeholders in the column of value appropriation. Uniquely, they also put public awareness into value discovery (Angeli and Jaiswal, 2016).
2.	The National Aeronautics and Space Administration (NASA)	The key strategies included establishing strategic relationships to leverage the resources of others and developing a forward-looking and flexible (and more collaborative) business model that would transform the Human Health and Performance Directorate (HH&P) into a learning organization more adaptable to change (Davis, et al., 2015).
3.	The GE Aircraft	The GE Aircraft engines unit crafted an innovative value proposition when they shifted from selling airline jet engines to selling flight hours. This shifted the risk of downtime from the airline customer to GE, and enabled GE to establish a very profitable service operation.
4.	Space Economy Startups in Emerging Industries	They defined several business model building blocks for private investments and new economic growth policies.

Note: processed by the author from various sources

Referring to the explanation presented about the current business model innovation and empirical evidence, space technology implementation needs to consider business models that are much more comprehensive and accommodative to the public needs. The discussion below is also a continuation of the study conducted by Spieth et al. (2014), especially on how to run a business. Their study explained the need for a stakeholder perspective and exploratory innovation or exploitative innovation in a business model canvas that also explains the design and value of the organization. For this reason, this study aims to complement and explore the innovation so that the business model can be more applicable and provide added value to the larger public. This is certainly a big goal for the object of this study, the government research institute.

3.1. R&D expenditure by businesses

The author's long experience of being involved in every business pattern in government research institutions encourages the need to develop current business models. The author realizes that businesses' aspects of R&D expenditure are fundamental when running a business. Since every activity still uses state resources, it is necessary to encourage business actors to ensure everything is in line. These business actors play a

crucial role considering that they are the closest to the market, and development often ideas can come from them. Many heads of work units also conveyed this in various focus group discussion sessions. For example, the 2020-2024 National Research Priority failed because of its inability to identify the end-user's needs. As a result, businesses are reluctant to involve their resources to support R&D.

George and Bock (2011) explained that the use of R&D expenditures by businesses could even encourage the creation of entrepreneurship research. Simply put, entrepreneurship can encourage activities that are more based on public needs. This is also reinforced by studies conducted by Alizadeh et al. (2018) and Falk (2006), explaining that research and development (R&D) in the business sector has a critical role in a knowledge-based economy because it results in commercialization and wealth creation with a high probability. The use of this aspect in the run the business element also allows the application of an open business model. Open business models enable an organization to be more effective in creating as well as capturing value. They help create value by leveraging many more ideas because of their inclusion of a variety of external concepts (Chesbrough, 2007b) and developing more outward-looking strategic approaches to research and development to source at least some knowledge of potential value from the broader environment in which they operate (Mina et al., 2014). Referring to empirical studies and experiences, the author believes that R&D expenditure by businesses is a crucial element in exploring the entrepreneurial potential for research actors. The pattern of activities to be carried out can be more oriented to public needs.

3.2. Wellbeing

The exploration of this wellbeing within the framework of a business model has been studied in previous studies. Stubbs and Cocklin (2008) explain the importance of this element to support the business model's sustainability. Their thinking is based on structural changes to the socioeconomic system (such as redesigning transportation and taxation systems) and cultural systems (such as attitudes toward consumption and economic growth). In another study, Harter et al. (2003) also explained that the application of wellbeing also impacted business outcomes. In the context of government research institutions in Indonesia, outcomes here can mean that all services provided are beneficial for the affected community, which is the public. Thus, the understanding of wellbeing meaning in the context of running the business must be reaffirmed as an element of the public that must be understood so that research activities are in line with matters related to improving the public's wellbeing. To ensure this, research institutions must understand market conditions related to business cycle volatility (Wolfers, 2003).

Synergy in the use of resources between government R&D and businesses ultimately has implications for wellbeing. An interesting issue is the ability to maintain the consistency of actors in the ecosystem. The implication concludes in end-user engagement with the resulting product. LSU, which is very good at solving the problem of labour shortages in the agricultural sector, should be consistently used, for example, in smart farming, which can be extended to all agricultural lands in Indonesia. However, this technology is less massively utilized, so end-users or communities do not directly feel the meaning of wellbeing for the abundance of agricultural products. Consistency is an obstacle that must be resolved immediately.

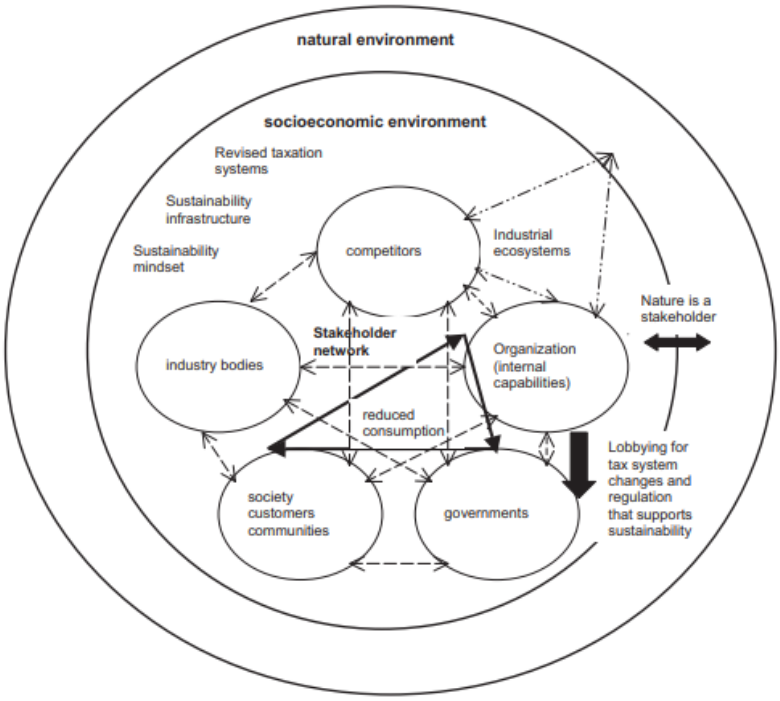

Figure 2. An Illustration of a Systems-Based Sustainability Business Model, adopted from Stubbs & Cocklin (2008).

Organizations can make significant progress towards achieving sustainability through their own internal capabilities. Changes to the socioeconomic system, both structural (such as taxation systems) and cultural (such as wellbeing), are required to facilitate firm-level and system-level sustainability. An organization adopting an SBM develops internal structural and cultural capabilities to achieve firm-level sustainability and collaborates with key stakeholders. At the systems level, an SBM is characterized by ubiquitous sustainable infrastructure such as sustainable renewable energy facilities and ecological tax reform systems. This requires changes in legislation and regulation, a "sustainability mindset" in society, and collaborative partnerships among stakeholders (such as organizations, competitors, industry bodies, governments, communities, NGOs, the media, and financial markets) to promote and develop sustainable infrastructure at a local and global level. Planning and implementing a system-based SBM requires the involvement of all stakeholders. A stakeholder network based on stakeholder collaboration aimed at improving the environment and society and traditional value creation is appropriate to support the development and implementation of the overall system vision, mission, strategy, planning and tactics. The structure can be a system that facilitates the achievement of sustainability. In industrial ecosystems (for instance, the space technology industry in Indonesia), companies closely coordinate the management of raw materials, energy, water, and waste management. The interdependent material and energy flow of the components is analyzed to reduce the environmental impact of the entire system. Consistent with the stakeholder network approach, Figure 2 does not place the organization at the centre of the network where multiple stakeholder relationships must work. There are no central nodes in the network, and the organization is just one of the participants in the network. Within SBM, many entities interact to achieve system sustainability. SBM operates and interacts within the broader socioeconomic system and natural environment. Figure 2 shows only the selected stakeholders and additional stakeholders, and their interactions need to be added to this model, such as non-governmental organizations (NGOs), media, upstream and downstream stakeholders in the supply chain, financial markets, and investors.

3.3. Sustainable cities and communities

Cities and communities today show a growing concern about sustainability issues, and they are increasingly trying to find means to preserve natural and economic resources (Ahvenniemi et al., 2017). A few companies and government bodies around the world have begun to explore the creation of "ecocities"—a term that overlaps and is sometimes used interchangeably with "smart cities" or "sustainable cities" (Alusi et al., 2011). In their study, Ordonez-Ponce et al. (2021) explain that sustainable cities and communities are also part of the organization's partnering efforts with their communities. Thus, the identification of community needs can be explored better and with precision. Aluchna and Rok (2018) called it a collaborative economy. It is not uncommon for collaboration to be considered a measure of success (Clarke, 2017) and can be used for schemes for its implementation in government R&D agencies. Performance measurement systems suggest that smart cities' initial target, defined as attaining sustainability of a city with the help of modern technologies, is not sufficiently addressed in some of the smart city frameworks (Ahvenniemi et al., 2017). While environmental sustainability is an essential target of smart cities (European Commission, 2012; United Nation Task Team, 2015), environmental indicators are clearly underrepresented in the smart city frameworks. Referring to the information obtained by the author from the research and development implementing unit at LAPAN, it is clear that R&D requires a review of this aspect in the run of the business so that the use of technology can positively impact cities and communities as part of the ecosystem.

In the indicative planning document for the development of the State Capital, smart cities and communities are part of the development targets that must be carried out. The use of space technology is very crucial in supporting this target, starting from disaster mitigation, which can reduce losses, the digital lifestyle supported by satellites, sustainable development supported by spatial-based development planning using remote sensing technology based on very high-resolution satellite imagery data, and smart patrol to improve city security through LSU Drone technology.

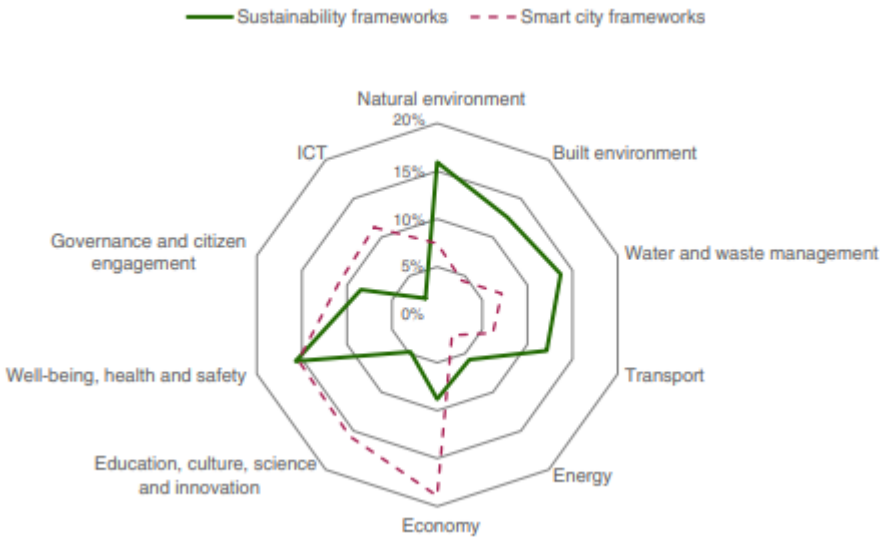

Figure 3. Indicators of Smart City and Urban Sustainability Frameworks under Ten Sector Categories, adopted from Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., & Airaksinen, M. (2017).

3.4. Adoption of emerging technologies.

The adoption of emerging technologies causes the overall changes in the business model (Sharma and Khanna, 2020; Karimi and Walter, 2016; Kamoun, 2008), so R&D agencies need to pay attention to public needs. Further exploration of this concept in the business model was also reported by Schiavi and Behr (2018). Measuring the user's ability to adopt technologies is an issue in Indonesia and causes the product to have less added value. For this reason, in 2020-2024, the government has intensively emphasized the need for technology that is able to improve the quality of processing so that community products can have higher added value. Recently, the National Research and Innovation Agency, for example, in a number of meeting agendas with the House of Representatives, has worked closely to seek appropriate technology that the public could directly feel. This is a very significant discussion and it is expected that the growth of the processing industry can increase and reach the target by the end of 2024.

Furthermore, the author's experience also contributes to the need concept to include this variable in the business model, considering the use of elements of technology, especially aerospace, in the community development sector is still minimal. The low literacy in technology is suspected to be the main factor. Low technology literacy constrains the application or adoption of emerging technologies . This is reinforced by a recent survey from the Directorate of Policy for Economic, Manpower, and Regional Development (2022) which explains that technological literacy is still an obstacle for most Indonesians.

Presidential Regulation Number 59 of 2017 concerning Sustainable Development Goals (SDGs), including the down streaming of R&D products, is growing, and R&D is required to to build partnership networks (R&D and/or funding) with external parties (government and private agencies). In the 2020-2024 period, LAPAN seeks to support the SDGs through Remote Sensing products for Protected Area Data, Pollution Prevention, Disasters, and Utilization of Natural Resources. In addition, LAPAN also produces Micro Satellite and remote sensing models. Those products were developed with the hope of obtaining support from businesses to adopt the emerging technologies so that they can provide benefits for the wellbeing and sustainable cities and communities.

Conclusions

The business model needs to have supporting elements that will greatly explain the involvement of these elements, such as research and development spending by businesses, welfare, sustainable cities and communities, and adoption of emerging technologies. Through these four elements, the knowledge gap to bring research and development activities closer to the community's needs will get better. The results of this study are to extend and close the gap in the concept proposed by Spieth et al. (2014), especially on how to run a business. In terms of research and development expenditure by businesses, it becomes an important variable in running a business because the business sector will be able to encourage the creation of commercialization and wealth with a high probability. Regarding wellbeing, a crucial point that needs to be noted here is that government research institutions need to pay attention to the volatility of the business cycle, as stated by Wolfers (2003). This element is important so that public needs become more attainable and facilitated. This can be achieved in the form of detailed research and development plans and the preparation of a platform for disseminating the results to the public or business people. Furthermore, the term collaborative economy (Aluchna and Rok, 2018) is important to ensure the sustainability of cities and communities. To ensure sustainability, it is necessary to establish partnerships, as described by Ordonez-Ponce et al. (2021). A transformation process is needed to encourage the adoption of emerging technologies. As explained earlier, the adoption and technology literacy process will be better with this transformation, at least for non-government business actors. Future study should focus on economic parameters such as return of investment (ROI) and cost and benefit analysis (CBA) to support sustainable development in ASEAN countries.

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Research Paper

Whole Community Development in Supporting Children's Literacy in Rural Areas

Community and Parents' Participation to Foster Children's Literacy in Rural Areas

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ABSTRACT

Indonesia was ranked 72nd out of 77 countries in reading assessment based on Programme for International Students Assessment (PISA). Through the National Literacy Movement, the Indonesian government attempt to increase children's reading proficiency, which is also an indicator of SDG 4.1.1. This study explores the important roles of the parents and community in improving children's literacy competencies. This study used a qualitative approach and collected both primary and secondary data. The findings highlighted that parents supporting children's literacy could improve children's reading interest and early-phase of reading competencies through the availability of reading corners and home-based literacy activities. There were 300 parents supporting children's literacy activities and 73 community facilitators facilitating 20 village reading clubs. The village government also supported the sustainability of the reading club by providing incentives for the facilitators and developing the infrastructure through village fund allocation.

Keywords: community education, community participation in literacy, parents' involvement in literacy, children's reading interest, children's literacy

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1. Introduction

Literacy and education are often viewed as the responsibility of the teachers (Gunning, 2000; Fox et al., 2003), school/ classroom quality (Vernon-Feagans et al., 2019), parents (Kiranti et al., 2021; Stacy 2019), community (Ng & Madyaningrum, 2014; Wijaya et al., 2020), and the government's policy (Papen, 2015). Based on the United Nations Educational, Scientific and Cultural Organization (UNESCO), literacy includes comprehension of listening, reading, writing, and speaking competencies applied in daily life (Fensham, 2008).

The Indonesian government has attempted to improve children's literacy through various programs, such as National Literacy Movement (*Gerakan Literasi Nasional*) and Community Literacy Movement (*Gerakan Literasi Masyarakat*) since 2016 (Kementerian Pendidikan dan Kebudayaan [Kemdikbud], 2016). The latest effort was introducing the Emancipated Learning (Merdeka Belajar) Campaign focusing on children's learning in Literacy, Numeracy, and Character Development. There is also a large-scale assessment called ANBK that assesses children's literacy, numeracy, and character competencies at the national level. Apart from that, high-quality teachers are required to achieve the quality literacy standard (Fox et al., 2003).

While improving literacy may focus on school intervention (Banerji & Chavan, 2016; Chew, 2018; Piper et al., 2018) and education policy change (Wyse, 2018), there are parts of community participation that may contribute to children's literacy assessment. Community education has been viewed as an alternative for improving engagement between parents-teachers and children (Ng & Neo, 2020). Many Indonesian studies also focused on school-level intervention in literacy, such as how to design literacy activities at school (Akbar, 2017; Dafit & Ramadan, 2020; Padmadewi & Artini, 2018; Wiratsiwi, 2020). However, there is an apparent, evident gap concerning how parents and the community can also support children's literacy. The previous research on how parents support children's literacy is only by parents attending school's invitation (Padmadewi et al., 2018) without any evidence and further research about how parents and the community may support children's literacy. The community resources and parents' support may significantly impact children's literacy by providing a more literate learning environment at home. This study aims to explore how the community may help to improve children's literacy and what the impact of children's literacy is when parents and the community assist them. There is no further research on how parents and the community can support children's literacy.

Indonesia consistently aims to improve children's literacy to achieve SDG 4, namely Quality Education. The Ministry of Education, Culture, Research and Technology has made a great deal of effort to allow the Indonesia education program to focus on literacy, numeracy, and education character through Merdeka Belajar (Emancipated Learning). These efforts are aligned with Indicator 4.1.1: Proportion of children and young people (a) in Grade 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex. Previously, there was also a literacy program movement called Gerakan Literasi Nasional/GLN (National Literacy Movement) introduced in 2015. Kurnia (2021) argued that the philosophy of progressivism influenced the philosophical foundation national literacy movement since it focused more on the effort to prepare the students to face 21st-century challenges. Even though it has a broader focus on numeracy, literacy, science, digital skills, financial skills, culture, and citizenship knowledge meant to be applied to the learners' daily life, it lacks focus on critical literacy, which is very important for the students (Kurnia, 2021). As part of GLN, there is also a community literacy movement (Gerakan Literasi Masyarakat/ GLM); however, there is limited research on this topic. Usually, GLM only focuses on the importance of literacy through socialization at the village level (Sanusi & Prasetyo, 2019) and the initiation of a reading camp (Hidayah, 2019) without further detail on how the reading camp's activities can support children's competencies on literacy.

Indonesian literacy profiles across provinces are diverse, with Papua, West Papua, West Kalimantan and East Nusa Tenggara holding lower literacy levels compared to those of the other provinces. This index is based on 4 dimensions: mastering (quality), access, alternative, and culture. The mastering quality dimension is indexed based on years of schooling and the number of people who are able to read and write. Access dimension is based on the availability of both public and community libraries and the bookstore. Dimension alternatives are focused on embedded technology (the use of Information Communication Technology/ ICT) and internet connection availability. The cultural dimension is about reading habits, both using paper and electronic devices, as well as how the community uses the public library. Based on the latest recommendation, there is a need to focus on the province with low literacy levels, increasing access to public libraries and community participation in fostering reading habits (Pusat

Penelitian Kebijakan Pendidikan dan Kebudayaan [Puslitjakdikbud], 2019). This study will focus on community participation in fostering children's reading habits and literacy competencies.

The results of PISA (Programme for International Student Assessment) in Indonesia are also lower compared to those of the other countries (The Organisation for Economic Co-operation and Development [OECD], 2019) The latest score was 371, categorized as Level 1 (out of 6 levels). This means that students can only identify some basic information that is explicitly available in the text. Furthermore, studies focusing on children in preschool and elementary school literacy usually used EGRA (Early Grade Reading Assessment) or STAR (School-based test about reading). From the latest EGRA, at the national level, approximately 70% of Indonesian students are able to read with comprehension. However, in the eastern provinces like Maluku, East Nusa Tenggara, and Papua, only 50% of students can read with comprehension (Stern and Nordstrum, 2014). Eastern Indonesian students' capacity in literacy is lower than that of the western provinces, which in turn is still lower than in other countries. The lower students' capacity in literacy, the more the literacy intervention needs to be carried out by the schools and the community.

The research findings on implementing literacy in Indonesia are usually embedded in the language lessons. Indonesian students usually learn literacy through the learning of Bahasa Indonesia in class. This subject is taught thematic-based in the schools. In the past decade, Indonesian the government encouraged the use of more literacy in school daily through embedded school local cultures and character education. A study found that the literacy program developed by local teachers and librarians positively impacts students' knowledge, characters, and intellectual recreation/ creativity (Fadhli, 2021). This was the impact of the school literacy movement introduced to schools.

Many schools in Indonesia have supported the National Literacy Movement (Gerakan Literasi Sekolah) through the implementation of various programs (Nuryana et al., 2020). The literacy program, for example, has been carried out in elementary schools with a 15-minutes pre-reading activity (Wiratsiwi, 2020). This literacy program can be expanded beyond reading and writing to numeracy, science, digital literacy, financial literacy, local culture, and citizenship. The implementation of the national literacy movement may positively impact students' attitudes towards literacy (Nuryana et al., 2020).

The national literacy movement is a public participation movement to raise reading habits and literacy for children. The literacy movement is an integrated movement to support literacy that needs support from various stakeholders, such as universities, businesses, local organizations, teachers, parents, and the community (Kemdikbud, 2016).

Children's literacy can be strengthened at the school level and at the community level. Some studies revealed that the engagement of both the community and parents has a positive impact on increasing children's literacy (Terlitsky and Wilkins, 2015; Park, 2008). The interaction between parents and children on learning literacy may significantly influence children's reading interest and print knowledge (Weigel et al., 2006). The children's literacy and behaviours are influenced by their parent's ability to teach them. High levels of parents' involvement in home literacy play an important role in children's reading competencies (Alston-Abel & Berninger, 2018). Most research regarding the community's role in literacy was carried out in developed countries, such as Western Europe (Hemmerechts et al., 2017), the United Kingdom (Hornby & Blackwell, 2018) and Australia (Daniel et al., 2016). Few researchers explored the cases in low-income countries, such as Indonesia, especially in disadvantaged areas. In Indonesia, parents' involvement is usually by attending school activities (Padmadewi et al., 2018), while at home, there are almost no activities carried out to foster children's literacy. It has been argued that a community education approach has an impact on community capacity and competence to be ready for large-scale effects (Ng & Madyaningrum, 2014). Using the educational prosperity framework (Willms, 2018), parenting and family involvement are crucial foundations for children's success. However, children from low socioeconomic backgrounds may lack educational access in the community.

Wahana Visi Indonesia (WVI) has implemented literacy programs from 2018 to 2020, including teachers' capacity building and parental and community involvement. Based on Puslitjakdikbud (2019), the reason for low literacy is cultural, which makes the community-education-based approach suitable to be applied, especially in the disadvantaged areas where school interventions need to be supported by the community participation. This study will address the research gap on how parents and the community can contribute to improving children's literacy and the impacts of parents' involvement on children's literacy. The research objectives will focus on the relationship between community and parents' participation in children's literacy and the benefits of engaging parents and the community in children's literacy. This study will also discuss the impacts of parents' involvement and community participation on children's literacy.

2. Methodology

The method used was qualitative. Qualitative research related to ideas, perceptions, opinions, and beliefs cannot be measured only by numbers. The research process involves hypothesis questions, collecting data, analyzing the data, building thematic analysis, and making interpretations of the meaning of data. The final written report has a flexible writing structure (Creswell et al., 2007). The data were collected through secondary data documentation (Monitoring and Reports) and primary data collection: Key Informant Interviews (KII) and Focus Group Discussion (FGD).

The type of qualitative research adopted here is a case study, which is the presentation of data in narratives from documentation and interviews to explain phenomena in a unique environment (Hariwijaya, 2016). The examined aspects are also subjective, namely from the customs or culture of the society (Connaway & Powell, 2010). A case study used various data sources to study individuals, institutions, or phenomena such as events or programs in a unique environment and an intense and detailed manner (Hariwijaya, 2016). The focus of the case study is not predominantly on the individual but more on the issue itself (Creswell et al., 2007).

The data were collected from several rural areas, namely Landak, East Manggarai, Biak, and Sentani (Jayapura). The case also explores the contextual condition (Creswell et al., 2007). The first step of interpretation focuses on the common themes, followed by the interpretation of the case meanings, which can be from learning or from unusual situations.

Data Collection and Analysis

The data were collected from the field. Primary data collections were conducted for the qualitative data through Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs). The secondary data were taken from regular monitoring, documentation, and reports. The data were collected from June to July 2021 in Landak, Biak, Sentani (Jayapura) and East Manggarai.

Table 1: Data Collection Process 2021

Data Collection Method	Sample/Informant	Type of Data
Primary Data FGD (Focus Group Discussion) KII (Key Informant Interview)	Field facilitators (for reading camps and children's groups), Teachers, parents, members of the Parent-Teacher Association (PTA)	Implementation Literacy Program at Community Level
Secondary Data	Technical Program Design Document, Baseline Report, Need Assessment Report, Annual Report, Monitoring Report, Vulnerability Survey Report (7 documents)	Program Design, Implementation and Monitoring

The primary data were obtained from 26 parents, 14 reading club facilitators, 21 teachers and 12 school principals across Sentani, Biak, East Manggarai and Landak. There were 11 FGDs and 12 KIIs during the study. The analysis examined and explained the process and the roles of community and parents in children's literacy and their impacts on the children's literacy. The secondary data were gathered from various reports of Wahana Visi Indonesia's education programs. The data were analyzed using thematic analysis to understand thoughts and behaviour across the data set, generate them, review, and define them (Kiger & Varpio, 2020). The thematic analysis was used to identify the process of literacy activities in the communities and home-based literacy activities. It was also adopted to find the impacts of the community-level intervention on children's literacy competencies.

3. Results and Discussion

Program Design Literacy

From the documentation of the Technical Design Education Program of Wahana Visi Indonesia FY18-FY21, the program design consisted of four components: reading assessment, teacher training (capacity building for teachers), community participation, and material creation. This program was designed based on the World Vision's Unlock Literacy project's model and contextualized into the Indonesian context, later known as Wahana Literasi. These four components were interconnected. Even though teacher training was the most significant component of improving children's reading competencies, home and community learning environments also played important roles.

Figure 1. The Design of Literacy Program

Six districts implemented the Unlock Literacy Program, intending to increase the literacy skills of early grade students. In Fiscal Year (FY) 2019, WVI conducted a literacy assessment using STAR (School-based Test about Reading) to provide critical information about children's foundational reading ability and measure the reading skills of Grade-3 students involved in the program.

Reading Assessment Data

From the documentation, the STAR assessment also collected background information from the surveyed students to identify the trends of conditions or issues related to the acquisition of the reading skills. The information included students' sex, spoken language at home, home literacy environment, and student engagement in school and community literacy programs. The following tables describe the results of the STAR assessment and related background information of the students.

Table 2: Profile of Student Respondents

PROGRAM AREAS	STUDENTS		TOTAL
	MALE	FEMALE	
Biak	46	47	93
Lauk Nayak	32	26	58
Sentani	27	19	46
East Manggarai	75	90	165
West Manggarai	38	36	74
Landak	41	38	79
TOTAL	259	256	515
Notes: More than half of these students (52,4%) did not enroll in early childhood education; 121 of them retained in Grade 1, and 65 retained in Grade 2.			

Source: Outcome Monitoring FY19 – WVI data (2019)

There was a total of 515 Grade-3 students in six assessed Program Areas with a balanced number of male and female students. East Manggarai AP had the highest number of surveyed students, whereas Sentani AP had the lowest.

Table 3: Students Background Information on Language and Books Availability at Home

AP	Language spoken at home	
	Indonesia	Local
Biak	84	22
Lauk Nayak	39	30
Sentani	44	12
Manggarai Timur	31	158
Manggarai Barat	12	77
Landak	27	64
TOTAL	237	363

Source: Outcome Monitoring FY19 – WVI data (2019)

Table 3 shows that the majority of the students used their local language or dialect at home.

Table 4: After-School Reading Activity Participation

PROGRAM AREAS	After-School Activities	Mobile Library	Village Library	Reading Club	Others
Biak	45	0	0	30	52
Lauk Nayak	8	2	0	6	5
Sentani	18	3	2	16	12
Manggarai Timur	107	0	1	107	91
Manggarai Barat	27	0	0	25	20
Landak	43	0	0	44	7
TOTAL (n)	248	5	3	228	187
(%)	37,0%	0,7%	0,4%	34,0%	25,2%

Source: Outcome Monitoring FY19 – WVI data (2019)

In terms of after-school reading activity, the top two programs with the highest number of participating students were after-school literacy activities (37,0%) and Reading Club (34,0%).

The materials creation component aimed to ensure that the communities had a variety of reading materials available. This was another essential part of the Unlock Literacy Program. The only print material children typically saw in most communities was school textbooks. Unlock Literacy practitioners worked with partners and communities to create engaging and relevant children's print material for Book Banks – collections of at least 50 books and reading materials in every village. With guidance on creating age- and language-appropriate materials locally, the communities can produce reading materials themselves and take advantage of an enriched literacy environment. The Community Action section of the toolkit guided how to develop simple beginning reading primers and guidelines for program staff on criteria to consider when selecting or developing reading materials for children across the stages of literacy development. Children can borrow materials from Book Banks and use them to practice reading at home, on their own, and with their parents.

Teacher training (School-based level intervention)

Teachers' training was implemented annually through nine series of capacity building to teach children how to read, focusing on key reading competencies: children's letter knowledge, phonemic awareness, fluency, vocabulary, and comprehension. After the workshop, teachers utilized the skills to teach the key competencies in the classroom and assessed the students' progress, including by using formative assessment. Teachers blended their strategies into a lesson plan. This literacy program enhanced teachers' instruction using the government's curriculum.

It was revealed that teachers play a significant role in equipping children with literacy. Primary school teachers also described children's improvement in their reading skills during the Focus Group Discussions. One of the teachers stated that the literacy program in school had helped children who were not able to read fluently as quoted below:

"It affected the increase of the number of children, who previously could not read, but now are able to spell and even able to read." (Teacher in Waupnor, Biak)

"There is an impact on students from being unable to read to being able to read…" (Principal of primary school Dobonsolo, Sentani)

Furthermore, based on the documentation report, the results of the teacher observation as part of the Outcome Monitoring FY19 demonstrated that 34 out of the 40 trained teachers (85%) had utilized the skills acquired from the training program to teach reading. This included applying the skills in teaching letter knowledge, phonemic awareness, vocabulary, and reading fluency (see Table 9). The report analysis also showed that only 7 of the 34 trained teachers (20,6%) used teaching aids in teaching reading, as shown in Table 10.

Table 5: Trained Teachers Utilizing Skills Acquired to Teach Reading

PROGRAM AREAS	(#) Teacher	Trained Teachers Utilizing Acquired Skills to Teach reading			
		Letter Knowledge	Phonemic Awareness	Vocabulary	Reading Fluency
East Manggarai (Mang-Tim)	12	91,7%	66,7%	50,0%	33,4%
West Manggarai(Mang-Bar)	15	86,7%	53,3,0%	40,0%	26,7%
Landak	7	57,1%	57,1%	57,1%	57,1%
Biak	6	33,3%	33,3%	0,0%	41,7%
TOTAL	**40**	**67,2%**	**52,6%**	**36,8%**	**39,7%**

Source: Outcome Monitoring FY19 – WVI data (2019)

According to Livie and Lentz as cited in Arsyad (2005, p. 16), teaching media is to provide a visual context to help students who are weak in reading understand the text, organize information, and remember. In other words, teaching media effectively accommodates students who are weak and slow to accept and understand the content of subjects with the text presented verbally. This finding can indeed be an option to consider for strategy improvement.

Two factors might contribute to achieving the outcome. The first was the proportion of children who can read with comprehension, and the second was the proportion of trained teachers utilizing skills acquired to teach reading. The proportion of teachers trained in the Unlock Literacy training was 89,8%, whereas the proportion of children currently attending the after-school literacy activities was 93,2%, as shown in the table below.

Table 6: Achievements of Program Outputs

INDICATORS	LOP Target	FY20 LOP Achieved	Accomplishment (%)
Output 2.1: Proportion of teachers trained on UL's teacher training	128	115	89.8%
Output 2.3: Proportion of children currently attending the after-school literacy activities	73%	2.039/2.787 = 68%	93.2%

Source: WVI ITT data (2020)

Regarding the achievement outputs related to teacher training, Wahana Visi Indonesia had responded to the COVID-19 impacts on the teaching-learning process in school by organizing online training programs to equip 6,528 teachers with the capacity to deliver virtual or online teaching in response to student learning from home (LFH) regulation. WVI also successfully distributed students' learning kits, consisting of textbooks, storybooks, radios, and other recreational items for 33,451 children.

Community Participation

As part of the whole development approach, a community action program is essential to improving children's literacy. The community literacy module included: how to develop a print-rich environment, parents' awareness workshop, and community reading activities. It included ensuring access to children's literacy resources and activities outside the schools. The activities were designed to foster children's literacy in their daily life. The community participation included families/parents, community facilitators, and the school management committee. The community facilitators were trained in literacy, whereas parents received information on the importance of children's literacy. Parents can engage in children's literacy activities and boost children's potential, which contributes to developing their knowledge about the world around them. Children can also access reading camps located in their neighbourhood.

Parents and the community actively supported the children in learning to read. Some parents voluntarily provided reading corners in their houses. Some other parents paid regular fees to support the literacy program in their villages. In addition to this, the program also involved community volunteers who had been trained to facilitate children's reading activities in reading camps or clubs. By the end of the program, there were 20 reading clubs with 73 active community facilitators helping children with literacy activities. More than 300 parents participated in the Literacy Training Program to help and support their children learning to read at home.

Table 7: After-School Reading Activities and Reader's Proficiency Levels

AREAS	After-School Reading Activities (%)	Reader's Proficiency Level (%)
1 Biak	18,9%	66,7%
2 Lauk Nayak	3,1%	62,1%
3 Sentani	7,6%	60,9%
4 East Manggarai (Mang-Tim)	45,5%	78,2%
5 West Manggarai (Mang-Bar)	10,7%	51,4%
6 Landak	14,0%	64,6%

Source: Processed from WVI data

Local ownership

Local ownership: the program's vision and priorities were developed with and owned by the community and local partners after an in-depth shared exploration of child well-being in their context. There were clear plans regarding how local actors could continue the mutually accountable dialogue and actions on child well-being priorities after the WVi's engagement ended.

Table 8: Level of Engagement in the Literacy Program

Level of Engagement	Description
Household	WVI intervention through their program has increased parents' support in children's literacy. The evidence can be seen in Landak AP as documented in the FY19 Annual Report. Despite less financial support from the village government, parents voluntarily contributed IDR 1,000.00 per child to help sustain the reading camp. Parents also created a good learning environment at home. To date, there were 23 home reading corners in Mengkatang village, 13 home reading corners in Pawis Hilir village, and 20 home reading corners in Angan Tembawang village, Landak District. Another interesting finding was that parents had become more aware of child protection issues. "We used to have high egos as parents, children must obey our wishes, but the condition is different now. We need to understand why they did such things and speak in their language so children can have a better understanding ... if we get angry, they are afraid of us and they cannot learn any more from us."
Community	Reading Club (Taman Baca or Pojok Baca) WVI empowered the community to develop selection criteria for selecting tutors for village reading clubs. School Committee AP had involved School Committees at the school level when disseminating programs to parents or caregivers of students and teachers. AP also encouraged the School Committees to carry out their roles as supervisors and providers of support to schools through the revitalization of the School Committee (WVI, 2018).
System and Structure	Schools were the main structure needed for the program implementation. Ensuring their ownership of the program was one important effort to achieve sustainability. Involving schools to present their own progress on Unlock Literacy to the government (District Education Office, Ministry of Education) was a good way to transfer the project models' ownership to schools and the government. Government ownership of the program was expected to be obtained by signing an MoU to implement the Unlock Literacy (UL) Program. The progress achieved during the TP2 implementation in FY18-FY20 was as follows: 1. Landak AP has signed the MoU to implement the Unlock Literacy (UL) Program. The budget had been allocated for the 2019 implementation. 2. Biak and Jayapura District were in the process of drafting the MoU to implement the Unlock Literacy Project's Model beyond the piloting schools. The MoU included the budget allocation for the 2019–2020 implementation. 3. The village government in East Manggarai and Landak accommodated the literacy activities or reading facilities – infrastructure provision of reading houses and incentives to tutors/community facilitators.

Literacy implementation using the whole development approach allows schools and the community to collaborate and contribute to SDGs 4.1 starting by 2030, all girls and boys should receive complete, free, equitable, and quality primary and secondary education leading to relevant and effective learning outcomes, especially in the Indicator 4.1.1: Proportion of children and young people (a) in grade 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex. By this means, the whole development approach can also enhance children's literacy through various partnerships. The literacy program in Landak District was supported by both the District of Education and the Village-level government. The District of Education released District Education Office Decree No 420/0027/SD/2019 concerning the designation of pilot schools, impacted schools, and infrastructure to support the Literacy Program and Village Decree No. 141/01/PEM/DES-AT/2019 concerning village facilitators for literacy and establishment of children reading group. This means the partnership at all levels including the district and village levels may accelerate the process of literacy improvement for the children.

Reading Corner at Home

Based on FGDs and KIIs, Reading Corner was used to encourage reading and writing activities at home. FGDs' participants in East Manggarai and Landak elaborated the how reading corners at home become essential for children's learning.

> "After we created a reading corner at home, children started to learn letters and numbers. Children become more enthusiastic to learn." (Parent, FGD East Manggarai)
>
> "I received training to create a reading corner at home. After my children and I built the reading corner, my children are willing to read at home." (Parent, FGD, Landak)
>
> "I think the children can learn and concentrate better at home. They are usually uninterested in learning, but now, they feel more motivated to learn letters, numbers, and vocabulary." (Parent, FGD, Landak)

Learning from stories and playing

Parent-children bond can also be strengthened when the parents use learning media available at home to assist their children's learning. The media allow them to interact, share stories, and play together more interestingly.

In the study, the parents were eager to assist their children with their daily activities after they understood the importance of literacy stimulation for children. They started to stimulate their children at home through story reading or other activities doable at home.

> "Now, I ask my children what the story is, and he continues to share the story from the book that he has already read." (Parent, FGD, Landak)
>
> "The children have more reading interest now after changing the layout of the reading camp and deciding which reading material that they want to put on the wall." (Parent, FGD, Landak)
>
> "We as parents can teach the children at home by introducing this inside the home. Children can also learn how to write it and make learning their habit." (Parent, FGD East Manggarai)
>
> "I teach my children using the objects near us, such as spoon and plate, and they start to count them." (Parent, FGD, East Manggarai)
>
> "I assist my children by providing them learning tools, such as storybooks." (Parent, Jayapura)

Changes in Parents' Behaviours, Children's Learning Progress, and Relationship Transformation

Parenting is not an instant process. By participating in the workshop, the parents tended to change their behaviour to be more active in assisting their children in learning. They also help improve children's letters knowledge and vocabulary.

> "Previously, I had a level of high ego. Children must obey our rules, but the condition has changed now. We need to understand why they do certain things and speak in their own way, so can we have better communication and understanding. If we are angry, they can't learn anymore." (Parent, FGD, Landak)
>
> "I started to give attention to my children, became more able to manage my emotions, and learn to understand children's development. I feel that being caring and patient will help them learn." (Parent, FGD, East Manggarai)
>
> "I spent more time with my children and have discussions with them. I became more patient when educating them at home." (Parent, FGD, East Manggarai)
>
> "In the classroom, the progress (of children who also learn to read at home) is better. The ones who actively participate (in the reading groups) are also able to read earlier compared to the ones who do not (participate)." (Reading group facilitator – FGD, Landak)
>
> "Children recognize letters, and those consistently coming to the reading group are able to read earlier." (Reading group facilitator, Landak)

"Teacher often distributes reading books to the elementary school students. Books given by WVI are very easy to read for Grade-1 students or those with lower grades. It is very easy for them to read because the books have illustrations, such as drawings and writing, which are very communicative and enjoyable for the children. They borrow the books from the teacher." (A participant in the Parents FGD – East Manggarai)

"Here, the children are very enthusiastic. They are still eager to do the activities, and these are the things that keep the reading groups running."
(Reading Camp Facilitator Dusun Pawis Hilir, Landak)

"Because we live near the Sentani lake, the students in the reading camp also discuss what living creatures may live in the lake, and what animals and plants live nearby." (Community Facilitator, FGD, Sentani/Jayapura)

There was a transformation in the parent-children relationship when the literacy program, positive parenting training/dissemination, and other training on child well-being or child protection issues were implemented. Parents' awareness of how they should treat their children has also been improved and reflected in their daily practices.

"Now, I accompany my children at home. If the parents did not provide any assistance at home, the children will not master the topics. We need to ensure whether our children understand letters and can read."
(Parents, Sentani District)

Children Literacy Improvement

Using documentation, teachers' utilization of literacy skills and participation of students in after-school literacy activities were the two program outputs with the highest target achievements during the program implementation. Furthermore, the children's literacy improvement was visible when their parents were involved in their learning at home. They developed a better understanding of letters knowledge, vocabulary and reading fluency.

"The majority of children now can read fluently even though one or two of them took a year to improve". (Community Facilitator, East Manggarai)
"My children are making progress on writing and reading." (Parent, FGD, Landak)
"My children can correct their own mistakes when writing a sentence." (Parent, FGD, Landak)
"My children like to read stories. "(Parent, FGD, Landak)
"I want to share my experience when assisting my children. Children can not only follow our rules without explanation. We need to consider their potential development and assist them slowly but consistently. If they already have independence, we don't need to demand them, but just guide them to be self-learners. My children were previously unable to read, but now they can spell correctly and read." (School Committee, Parent, FGD, Biak)
"There is a need for consistent study time, so children can have good reading skills." (School Committee, FGD, Biak)
"We as parents also have to build a good and regular communication with the teachers, so that we can get their recommendations on how to assist our children in learning at home." (FGD, Parent, Jayapura)
"Thank God, the teacher is supportive of my children's development and consistently informs us how to teach them. This allows us to pay attention to the children's literacy skills. The teacher also constantly notifies us when there is homework." (Parent, FGD, Biak)
"The literacy program has an enormous impact on the children. Previously, they could not read, but now, they can spell and even read." (Teacher, FGD, Biak)
"I have a student who initially was very difficult to read, but last time I assessed, he can already read. I have told this story to the principal." (Teacher, FGD Biak)

"The children who were previously unable to read can now recognize letters and construct sentences after their parents started to teach them using learning media at home." (Parent, FGD, Sentani)
"The children develop a higher interest in reading and like to read when they visit the reading camp." (FGD, community facilitator, East Manggarai)

Children's Future

The majority of parents, teachers, and community facilitators supported children's literacy because of their willingness to facilitate the children's future.

"I teach them literacy so that they can develop a good character in the future." (Teacher, Landak)
"I teach them literacy because they are our future leaders." (Teacher, Landak)
"I want to assist my children because I want to be a role model for them." (Parent, Landak)
"The future will be better for them if they have good literacy." (Parent, Landak)

Challenges in Assisting Children's Literacy Activities

Even though there are more promising practices on how parents can enhance children's literacy, several challenges also exist related to the time-wise use of technology to allow children to learn and play.

"We just had electricity here in the village, so children spent most of their time on TV." (Parents, Landak)
"Children are attached to smartphones and TV, so we made an agreement on study time and playtime." (Sentani, Papua)
"I have several children. It is difficult to assist all of them by using only one strategy because they are unique and need a personalized learning experience. This will prevent them from disturbing each other. To solve this issue, I made different study activities for them." (Manggarai Timur)

Schools' and Parents' Relation

"The parents are enthusiastic during the information dissemination on the importance literacy the children. They are willing to support it." (Principal, East Manggarai)
"Parents and school committee support the children's learning. They created a reading camp in their communities." (Principal, Sentani)
"Parents and school committee have an informal discussion about the children's development and their literacy, both in the school and community." (Principal, Biak)

The review also discovered that, prior to the COVID-19 pandemic, children benefitted from the literacy teaching methods delivered by their teachers. This enabled the students with poor reading proficiency to improve their skills. After the school hours, the students also enjoyed after-school literacy activities and reading activities in their villages. However, there were two major concerns here. The first was the lack of support for the reading camp's facilitator to better organize the reading activities for children and help those with poor reading skills. The second was little knowledge and awareness of the parents regarding their responsibility to assist their children's learning.

In addition, the review results (based on the outcome monitoring data in FY19) showed a moderate achievement of 85% of the trained teachers who utilize the skills acquired from the training in teaching reading, with notes for future improvement. More specifically, the teachers were committed and consistent in applying the literacy teaching methods and teaching aids as recommended in the literacy teaching guides.

Community Participation in Literacy

The community that took part in supporting literacy consisted of multi-stakeholders, such as school committees, community volunteers/community facilitators, and parents. There was motivation to

develop reading clubs or reading groups at the community level. There were reading camps and at least 20 reading clubs with weekly activities to support children's literacy. Also, 73 community facilitators supported these reading clubs and actively enhanced literacy. Some activities carried out in the reading camps were reading a storybook, creating reading materials, singing a song, and making simple reading media. When parents allowed their children to visit and learned at a reading club, there was an opportunity to assess and guide the students, especially those who regularly visited the reading camp and reading club. We found that children who regularly visited the reading camps or reading clubs had increased reading interests. "The children now have more interest in reading and like to read when they visit the reading camp." (FGD, community facilitator, East Manggarai). The students also discussed what they found in their neighbourhood, such as animals and plants living in and around the Sentani lake. This encouraged the children to share a story and improve their literacy vocabulary.

This study also confirmed another study that reading clubs can support and motivate children to enhance their literacy (Morrow et al., 2017). Furthermore, early intervention using a community-based approach may improve the literacy and access of those from low-socioeconomic status to literate environments (Wah, 2020). This happens because the designed activities improve children's engagement. Community-based literacy programs can also be alternatives for bottom-up accountability measures. Community education involving parents, teachers, students, and communities can be an alternative to holding the education system accountable for supporting inequitable learning material distribution in literacy and the local languages (Morrell, 2017). All the reading camps and reading clubs in this study supported the use of Bahasa Indonesia as the national language. They also considered the use of local language and dialect to bridge and foster children learning in literacy. The more the community works together to support children's literacy, the more willing the local government at the village level to support a reading camp by providing necessary equipment and human resources (e.g., community facilitators), like the local governments of Landak and East Manggarai did. The capacity development of a community facilitator is also crucial in improving children's literacy regularly (weekly, fortnightly, or monthly). The village-level government also supports the community-level intervention by providing incentives for the reading camp/club facilitators and developing the infrastructure. This community-based literacy intervention can be adopted into the regent's regulations and included in the village's annual budget plan to achieve sustainability.

Parents' Involvement and Home-based Literacy Activities

Apart from the roles of a community facilitator, parents play a significant role in assisting children in learning literacy. Early parents' involvement in children's literacy may affect children's reading achievement and children's self-regulated learning (Daniel et al., 2016). By having a reading corner at home, parents and children can interact and work together to improve the children's literacy skills, such as learning letters, numbers, vocabulary, and practising other literacy activities, such as reading a story together and telling a story. The children may also have an improved reading interest. This finding is in line with another study that found setting a reading corner at home can improve children's reading habits (Bano et al., 2018). Three hundred parents supported children's literacy development by providing a room for regular discussions, sharing stories and creating a reading corner together at home. The learning process is also simple for learning from the things inside the home, such as learning vocabulary and counting by using spoons and plates.

There was also a transformation in the relationship between parents and children found when parents assisted their children in learning literacy. Parents who previously pushed and demanded their children to obey them had become more 'open-minded' to implement certain strategies, find another one and become patient in assisting children's literacy. This study is also aligned with another study that found a literacy program positively influences parents' parenting practices (Terlitsky, & Wilkins, 2015). In the FGDs and KIIs, parents expressed that they have begun to "understand children's language", which means they have developed more empathy and understanding of their children's needs. They no longer forced their children to learn but rather encouraged them to learn while playing. A longitudinal study by Watkins and Howard (2015) confirmed that positive interaction is built between children and parents (with low socioeconomic status), especially when parents assist their children in learning. The involvement of home-based parents has a strong correlation with children's academic achievement. Parents can follow children's literacy development process by having a positive parenting approach. Parents are able to notice the changes in their children's behaviours and have more time to read a story

and discuss with the children. The more the parents have regular interactions and discussions with their children, the more engagement and positive impacts are created. Parents can also notice when the children self-correct when making a mistake. The study results confirmed that children-parents interaction could strengthen children's literacy competencies in letter knowledge, vocabulary, and even reading fluency.

After the community and parents were involved in children's literacy children started to understand letters, improved vocabulary, and read. This study also found similar research that the more parents talk with children and ask open-ended questions, the more vocabulary the children will obtain. This can provide more language input for the children to build their vocabularies (Troseth et. al, 2020). The involvement of parents from low socioeconomic backgrounds (SES) is usually later compared to parents with high SES in children's reading and literacy activities in early primary years (Kurtulmus, 2016). Children may have better reading and literacy competencies by having early involvement in literacy activities through positive parenting and engagement in community reading camps or reading clubs.

In regards to literacy competencies, the outcome of Wahana Visi Indonesia's monitoring data indicated that the intervention literacy programs from 2018 to 2019 at schools and in the communities had a positive impact on children's literacy, particularly in the aspect of reading with the comprehension. This had been assessed and proven through STAR (School-Based Test about Reading). While teachers' competencies highly influence children's ability to read with comprehension in teaching reading, this study highlighted that parents and community facilitators also stimulate the ability. In other words, parents and community facilitators contribute to developing the early stage of children's literacy, such as improving their reading interest, enhancing their understanding of letters, new vocabulary, and ability to start reading.

> "My children are making progress on writing and reading." (Parent, FGD, Landak)
> "My children can correct their own mistakes when writing a sentence." (Parent, FGD, Landak)
> "Children who were previously unable to read can now recognize letters and construct a sentence after their parents learn to teach them using learning media at home." (Parent, FGD, Sentani)
> "The majority of the children now can read fluently, even though one or two took a year to assist them". (Community Facilitator, East Manggarai)

Future studies on this issue are expected to explore the correlation between parents' involvement and community participation in children's ability to read with comprehension. It is also recommended that they should investigate the roles of parents and children through a quantitative approach or mixed-method.

Conclusions

This study highlighted that the roles of community and parents can support the roles of school in the intervention of literacy programs, especially those run in the rural areas with low SES families and low-income countries. The active engagement between parents and children can positively influence children's reading interests. The findings revealed that 300 parents were willing to support children's literacy. It helped boost children's reading interest and the development of early phase reading competencies through the availability of a reading corner and home-based literacy activities. Several home-based literacy activities between children and parents, such as creating a reading corner together, reading books, telling a story, and discussing/ asking questions about the story, may significantly influence both children's reading interest and literacy competencies. This study found that the interaction between children and parents can foster literacy development, especially in letter knowledge, fluency, and vocabulary. During the process of assisting children's literacy, parents tended to use a positive parenting approach because of the frequent engagement and discussion with them. In terms of community-based intervention, seventy three community facilitators supported 20 village reading clubs. The village-level government also supported the community-level intervention by providing incentives to the reading camp/club's facilitators and developing the infrastructure. This community-based literacy intervention can be adopted into the regent's regulations and included in the village's annual budget plan for its sustainability. This proficiency in literacy as a result of community participation may also contribute to the

achievement of SDG No. 4.1.1. It is suggested that further research should explore the impacts of community's and parents' roles on children's ability to read with comprehension using a mixed-method or quantitative approach.

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Policy Paper

The Impact of Biofuel Intensification on Integrated Climate-Land-Energy-Water System

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ABSTRACT

Producing biodiesel using a mixture of palm oil is one of the main policies today. This paper studied the interactions among climate, land, energy, and water in a model to address national biofuel intensification policies and identified biofuels' role in fulfilling energy needs, the trade balance, and reducing greenhouse gas emissions. The integrated climate land energy system (CLEWs) model was employed here. The model simulated the implementation of B30 in 2020 (B30/20), B40/25, and B50/30. The results showed that the implementation of the B30/20, B40/25, and B50/30 scenarios requires 15.30, 20.20, and 25.10 million tons of Crude Palm Oil (CPO), respectively. In terms of land, implementing the B30/20, B40/25, and B50/30 scenarios needs an additional 8.36, 69.33, and 80.38 thousand km2 of oil palm plantations, respectively 2030. In terms of emission, implementing the B40/25 and B50/30 policies can reduce 160 MTon and 320 MTon CO2-eq, respectively by 2030. There is no irrigation system needed in oil palm plantations. The paper recommended that the biofuel incentives or need price mechanism formulation and land allocation policies by using marginal/critical land for new oil palm plantations. The policy should be used to improve the yield or crop productivity of palm oil plants.

Keywords: biofuel, intensification, implementation, emission, and plantations.

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1. Introduction

The economic driving sectors of a country are very important to support the prosperity of human life through a series of measurable activities that are interrelated. However, due to climate change driven by environmentally-unfriendly development activities, poor environmental quality will have a global adverse impact on the material and value balance in the development production process (Zhou et al., 2013; 2016). The massive use of fossil energy in developing countries is also a key contributor to the formation of global CO_2 emissions. The Association of South-East Asia Nations (ASEAN) is currently in the medium-term predictions due to its dependence on coals and natural gases. Between 2005 and 2030, it is estimated that energy consumption will increase by almost three times, whereas CO_2 emissions will rise fourfold (Kumar, 2016). In this condition, Indonesia is still heavily dependent on fossil fuels and traditional biomass to maintain household energy needs in rural areas. However, Indonesia also shows concerns about the issue of CO_2 emissions and starts to find alternatives, such as using its new and renewable energy (RE) sources compared to other countries in ASEAN (Handayani et al., 2019; Kumar, 2016).

The current energy status in Indonesia

The commitment of Indonesia to the National Determined Contribution (NDC) is to reduce unconditional greenhouse gasses (GHG) emissions by 29% and a conditional reduction target of up to 41 % from the Business As Usual (BAU) scenario by 2030 (Amheka & Higano, 2015; Government of Indonesia, 2016; Siagian et al., 2017). This covers energy, agriculture, industry, waste, and forestry sectors. In the energy sector, electricity use is expected to reduce significantly by 605 and 645 million tons by 2030, which is higher than the BAU and ambitious RE target scenario by 2050 (Reyseliani & Purwanto, 2021). However, the current RE in the Indonesia primary energy mix is still very low at around 11.7% in 2021 (Ministry of Energy and Mineral Resources [MEMR], 2022). To achieve a 23% energy mix in 2025, the gap is still large and needs to be closed by around 11.3% within the upcoming three years. This consequently makes concrete actions and strategies necessary. Nevertheless, Indonesia has a large potential for RE utilization, as identified in Table 1.

Table 1. Indonesia's RE Potential and Utilization

No	Energy type	Potential (GW)	Installed capacity (MW)	Utilization (%)
1	Geothermal	23.36	2,276.9	9.747
2	Water	94.62	6,601.9	6.977
3	Bioenergy	56.90	1,920.4	3.375
4	Solar	3,294.4	195.4	0.006
5	Wind	154.9	154.3	0.100
6	Others (Ocean energy)	59.90	0.6	0.001

Source: Ministry of Energy and Mineral Resources, 2022

The massive use of RE needs to be promoted and implemented with various approaches involving various entities (national and local engagement). Critical points of the system and representation are highly needed. Indonesia has unique characteristics because it is an archipelagic country covering more than 17,000 islands. All recorded RE potentials are the accumulation of various potentials that exist in archipelagic areas within Indonesia. The challenges here are not only preparing the basic infrastructure for RE development but also stimulating the active involvement, i.e., facilitating communication and interactions within a transdisciplinary context, in which the interactions are more refined on smaller geographical scale contexts (Ramos et al., 2021). Related to internal aspects, the data availability and accessibility become the main baseline in carrying out various RE policy optimizations in Indonesia besides the main foothold through INEP targets, as shown in Table 2.

Table 2. Indonesia's National Energy Policy (INEP) Targets

No	INEP Targets	Units	2015	2020	2025	2050
1	Primary energy supply	Million TOE	-	-	> 400	>1.000
2	Energy Mix target					
	a. Renewable Energy	%	-	-	> 23	>31
	b. Crude oil	%			< 25	< 20
	c. Coal	%	-	-	> 30	>25
	d. Natural gas	%	-	-	> 22	> 24
3	Provision of electricity generation	GW			> 115	> 430
4	Electrification ratio	%	85	100	100	100
5	Utilization of primary energy per capita	TOE	-	-	1,4	3,2
6	Utilization of electricity per capita	kWh			2.500	7.000
7	Energy elasticity		-	-	< 1	
8	Decrease in energy intensity	%	1% per year			
9	Household gas usage ratio	%	85			

Source: Indonesia National Energy Policy [INEP], 2014

As an archipelagic country with a population of 271 million (Biro Pusat Statistik [BPS], 2021), Indonesia has plenty of natural resources and the potential for a primary energy mix. With a large population, it is important to manage energy consumption thoroughly. In 2021, it was recorded that the national electrification ratio was 99.45% (MEMR, 2022). The most significant final energy mix consumption is still non-RE at 63%, while the rest is for RE and supply for national electricity. This condition is a challenge. If solved, it can be a stepping stone towards the fulfillment of national energy policy targets by maximizing the use of EBT in accordance with the potential natural resources, economic values and social impacts for local and national communities. The implementation of the development and use of biodiesel using a mixture of palm oil is one of the main policies of the Indonesian government today (Prananta & Kubiszewski, 2021) in addition to finding sustainable energy as well as encouraging the national economy. Although there are negative impacts of developing biofuel production on food security, land use change, and CO2 emissions (Acheampong et al., 2019), there are also some positive impacts on the social, economic and environmental aspects.

Today, oil palm plantation areas in different provinces of Indonesia have grown at different rates. Some provinces have changed some land functions from plantations to residential areas, industrial zones, and many more. The average growth of the oil palm area by provinces in Indonesia between 2017 and 2021 was 0.91% (Directorate General of Plantation, 2019). This is important baseline information for the government if the palm oil-based biodiesel intensification policy is to be applied. Today, the world has developed and utilized biodiesel as an important channel for reducing CO2 emissions (Borugadda & Goud, 2012), improving energy security, promoting technological innovation, creating jobs, and developing regional economies (Haberl et al., 2012; Kochaphum et al., 2015).

Currently, the main producers of biofuels in Southeast Asia are Thailand, the Philippines, Indonesia and Malaysia (Kumar, 2016). The biofuel producers were primarily motivated to enhance energy security by reducing energy imports (Aviso et al., 2015). A mandatory blending of biodiesel has been carried out in several countries. For example, Indonesia requires a mixture of diesel and diesel fuel with a composition of 30% diesel and the rest being diesel fuel called B30, 40% of diesel and the rest being diesel fuel called B40, and so on (Prananta & Kubiszewski, 2021). The Malaysian government has successfully involved all key components of local stakeholders as well as one of the backbones of the national economy (Zulqarnain et al., 2020). However, it is necessary to carefully ensure the level of profit for the overall green economy aspect (Gasparatos et al., 2017). Increasing the economic scale in the utilization and development of bioenergy to achieve national energy independence can be quite optimal in a concrete way with the existence of chain benefits starting from the upstream to the downstream side, including the political economy of oil supply in Indonesia (Rahman et al., 2021). Aviso et al., (2015) observed the economic impacts of climate change on the implementation of mandatory biodiesel blending. Directed implementation of research and development of bioenergy in relation to risk has been carried out (Benjamin et al., 2015) in industrial parks, and its strategies are implemented within industrial complexes (Tan et al., 2016).

Exemption toward biofuel investment has been reported (Prananta & Kubiszewski, 2021), but it provides an opportunity to continue investing with certain limitations to palm oil intensification and its relationship to climate change (Aviso et al., 2015) as well as various comprehensive assessments on the optimization of the bioenergy technology used (Song et al., 2015). The Australian government has made a great deal of effort through a comparative environmental performance of biodiesel produced by Moringa Oleifera oilseeds which can significantly reduce the impacts of global warming on the environment (Biswas, 2008). This gives added value to the diversification of raw materials for biofuel mixtures as the potential of each region.

Energy system modelling

Urban et al., (2007) assessed several energy models by comparing the models based on the characteristics of developing countries to get an insight into present-day energy models. However, they could not find any correlation between differing results and the availability or unavailability of certain method parts. Welsch et al., (2014) have used the General Circulation Model (GCM), Water Evaluation and Planning (WEAP), Long-Range Energy Alternatives Planning (LEAP), and Agro-Ecological Zoning (AEZ) models, and integrated them into a CLEW approach to capture their interlinkages to find out consistent strategies for countries that aim to implement integrated policies with potential implications for multiple resource systems. Timmons et.al. (2019) simulated scenarios consider of electricity from RE case study Mauritius and its related including demand-side management and costs of electricity generation approach to get effective cost for fully RE in the nation. Hermann et al. (2012) had originally developed targets and implications for CLEWs resources focusing on the intensification of agricultural production and the potential introduction of Jatropha as a biofuel. The focus of the global CLEWs model was the development of a compact and easily understandable tool (Weirich, 2013). Under the Scopus database by using key words “climate,” “land,” “energy,” and “water” or “CLEWs,” there is no research or assessment found related to the CLEWs strategies in Indonesia. Research on the energy system in Indonesia is also rare. Prambudia & Nakano (2012) examined specific challenges and possible policies for the Indonesian economy, i.e. coal, oil, and gas, and its regulatory environment (impacts of fossil fuel exploitation on Indonesia’s environment) to get an insight into how a better utilization of Indonesia’s RE potential could help achieve CO2 and pollution reduction targets. Kumar & Madlener (2016) estimated and analyzed the RE potential in the energy mix and its CO2 emission for Indonesia and Thailand. Until now, no work has been done with the integrated CLEWs model of Indonesia. This work became the first study focusing on the Indonesia’s CLEW system.

Purwanto et al. (2015) developed a multi-objective optimization model and analyzed the adequacy of energy sources, economic and environmental concerns to support future Indonesia’s long-term electricity demand. They said that RE could play a significant role in supporting a more sustainable electricity system in Indonesia; hence, identifying optimal solutions is mandatory. Yoo & Kim (2006) investigated the causality between electricity generation and economic growth covered the 1971–2002 period. The results show that there has been a rapid growth in electricity generation for the consumption of households and industries, especially factories and commercials sectors. Rachmatullah et al. (2007) made a simple scenario to devise a long-term electricity supply plan for the Java–Madura–Bali electricity system. Schmidt et al. (2013) investigated the RE based village grids in Indonesia for specific reasons by using a quantitative and qualitative approach. They suggested that reforming the national renewable and electrification policies is needed. Wijaya & Tezuka (2013) analyzed the electricity consumption characteristics in two cities under specificities of different cultural characteristics linkages to the impact of education levels on electricity consumption awareness. Gunningham (2013) attempted to manage a complex Indonesia ‘energy trilemma’ involving competing demands of energy security, climate change mitigation, and energy poverty. He argues that more natural gas and LNG plants should be built, whereas oil-based power plants should be converted into gas rather than coal-orientated. A transition to a low carbon economy is expected to be achieved through credible governance strategies.

Setiawan & Cuppen (2013) investigated stakeholder perspectives on carbon capture and storage in Indonesia by using the Q methodology. Igos et al. (2015) observed modeling systems to analyze the environmental impacts of bioenergy policies for sustainability. The rest of the paper is organized as follows. First, an introduction and detailed literature review are provided related to the use of biodiesel at the global, national and regional scale. It is then followed by a methodology that integrates the CLEW

system with the development of the scenarios and is linked to palm oil plantations and NDC policy. After that, results and discussion that accurately link all aspects assessed in this work are discussed. Finally, conclusions, recommendations, and policy implications are presented.

2. Methodology

The study used the integrated CLEWs model as a basic methodology. The model is based on a bottom-up representation of physical systems given the interrelationships among climate, land, energy, and water systems. Each component is described based on its technical and economic characteristics, allowing cost-effective strategies for each policy scenario and result to be identified. OSeMOSYS – an open-source energy modeling tool – is the engine to model all the resource systems to understand the interaction among climate, land, and water and address energy policy change related to NDC. In general, the structure is divided into energy, land, crop production, and water supply. It is a linear optimization model with a modeling period from 2015 to 2030.

The energy system model consists of demands for energy in the end-use sectors (i.e., industrial, residential, commercial, transportation, and others), commodity trading (export/import), transformation in the power sector, and domestic energy resources. The structure is modified to represent Indonesia as an archipelagic country. The power sector model is developed by the five big regional system, covering Sumatera-Java-Bali, Kalimantan, Sulawesi, Maluku Islands, and Papua, by considering the existing transmission dan distribution planning. However, in the model, the demand and supply of energy is calculated at the national level. Energy balance from the Handbook of Energy and Economic Statistics of Indonesia is used to develop a base year projection. Projection of energy demand is driven mainly by GDP, and the population refers to the scenario used in the Grand Strategy Energy study.

The reference energy system of Indonesia with all energy flows as well as the technologies that use and produce these energies are illustrated in Figure 1. Traditional biomass is still utilized by the residential sector, particularly in rural areas. In 2019, the share of biomass in the primary energy consumption was less than 4%. Most of the energy consumption in Indonesia comes from domestic resources (MEMR, 2022). Indonesia is one of the biggest exporting countries of coal. Around 75% of Indonesian coal production is exported, mostly to China and India. In the domestic setting, coal is the most widely used energy source in power generation. Coal generates more than 60% of electricity production in Indonesia (MEMR, 2022). Indonesia is also a natural gas producer and one of the LNG exporting countries. The current policy of Indonesia is to prioritize natural gas production for the domestic markets. However, Indonesia has a high dependency on oil imports. Almost 60% of the domestic oil consumption comes from imports due to the low domestic oil production. An ambitious target has been set by 2030, namely to reach one million barrels per day of oil production and 12 TCF per day of gas production (MEMR, 2022).

Multiple strategies have been introduced by the Indonesian government to reduce domestic oil consumption. Mandatory use of biofuel is one of the key policies to reduce oil consumption in the country. In 2020, the portion of biodiesel in diesel consumption rose to 30% from 20% in the previous year. The mandatory biofuel use was first implemented in 2008 with a biodiesel content of 2,5% (MEMR, 2022). Gradually, the biodiesel portion increased to 7,5% in 2010. Between 2011 and 2015, the biodiesel content increased again from 10% to 15%. Then, from January 2016, 20% of biodiesel shares was utilized in all relevant sectors. The B30 program has also helped reducing diesel imports, saving Indonesia's foreign exchange about Rp. 63 trillion, and increasing domestic demands for Crude Palm Oil. Moreover, the government has planned to increase the biodiesel portion to 40% and 50% (MEMR, 2022).

Biofuel intensification is chosen as the main scenario in the study not only because it is one of the government's strategic programs but also covers key sectors in CLEWs, i.e., land, water, and energy. Land and water are naturally needed for palm oil production. Figure 1 shows the climate, land, energy, and water system interrelation supporting the demands for energy in agriculture, commercial, industry, residential, transportation, and exports.

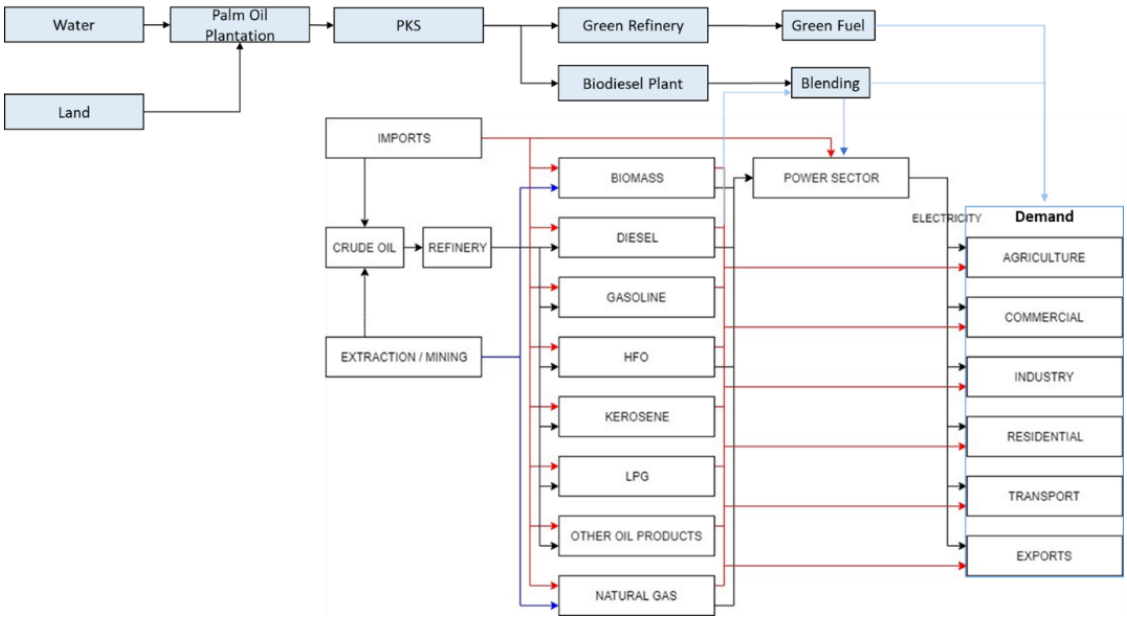


Figure 1. Reference of Energy System of Biofuel on the CLEWs Model
Source: CLEWs Modelling

Water dominantly comes from irrigation tunnels in palm oil plantations. Regularly fertilized lands also contribute to maintaining the productivity of palm oil plants. The government's plan to increase the portion of biofuel to 40% and 50% is considered an alternative scenario in the current study to better understand the interaction and the implications of the biofuel intensification program on emission reduction, land needs, and water usage.

B30/20 is the baseline scenario referring to the existing biofuel mandatory policy, namely the Minister of Energy and Mineral Resources Regulation No. 12/2015 that requires 30% of biodiesel to be blended with diesel in all end-use sectors starting from the 1st of January 2020. The second scenario is B40/25, in which 40% of biodiesel should be blended with diesel oil by all sectors starting from 2025. The third scenario is B50/30, in which the implementation of 50% Biodiesel shall start from 2030. The scenarios will include the use of biodiesel and the use of 0.1 million KL of green gasoline from 2022 to 2030.

Currently, the mandatory biodiesel program is to blend diesel with biodiesel (B100) that is conventionally produced through transesterification of Crude Palm Oil (CPO) fats with methanol. Fresh fruit bunches from a palm oil plantation are collected and transported using trucks to CPO Plant or *Pabrik Kelapa Sawit* (PKS) to be ground, compressed, and extracted to Crude Palm Oil (CPO). This CPO product can be directly used as the feedstock of the Biodiesel Plant through the transesterification process and produce Fatty Acid Methyl Ester (Biodiesel). The CPO to FAME conversion rate is one million tons of CPO, which is equal to 32,7 PJ of FAME. Further, FAME mixed with diesel oil in the blending facility will result in BXX (Alkabbashi et al., 2009).

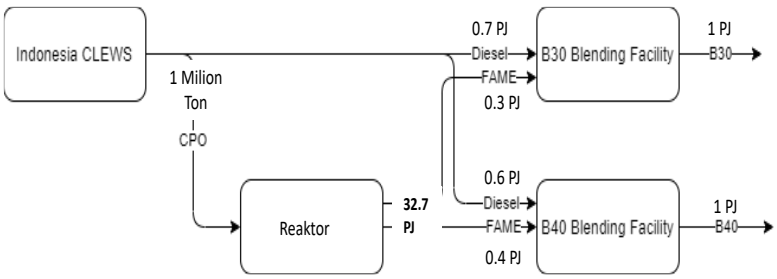


Figure 2. Integration of Indonesia CLEWs with Biofuel Processing
Source: CLEWs Modelling

However, to increase the biofuel content to more than 30%, diesel should not be only blended with FAME but also mixed with green diesel (D100). Green diesel is made by refining CPO in a dedicated refinery or by refining the CPO derivatives in a single process. Before the green diesel refinery process, CPO must be refined, bleached, and deodorized until it becomes Refined Bleached Deodorized Palm Oil (RBDPO). This study considered two different green diesel processing technologies, namely stand-alone refinery and co-processing refinery. The main difference between the two in this model structure is that green diesel is made using co-processing technology, whereas the RBDPO and oil stream (residue/diesel/kerosene) are produced in the existing oil refinery. In stand-alone technology, the RBDPO is the only feedstock on converting to green diesel. In this model, the input-output ratio for co-processing technology is 0,6 million tons of CPO which is equal to 1,2 PJ of green diesel, and 1,64 million tons of CPO which is equal to 0,5 PJ of green gasoline. For the stand-alone technology, we add a green fuel refinery as a new technology in the model structure to allow 100% RBDPO to react with hydrogen using a specific catalyst, generating green gasoline and green diesel. The input-output ratio for the stand-alone refinery is one million tons of RBDPO, which is equal to 3,46 PJ and 1,97 PJ of green diesel and green gasoline, respectively (M. Yusuf, personal communication, April 23, 2019).

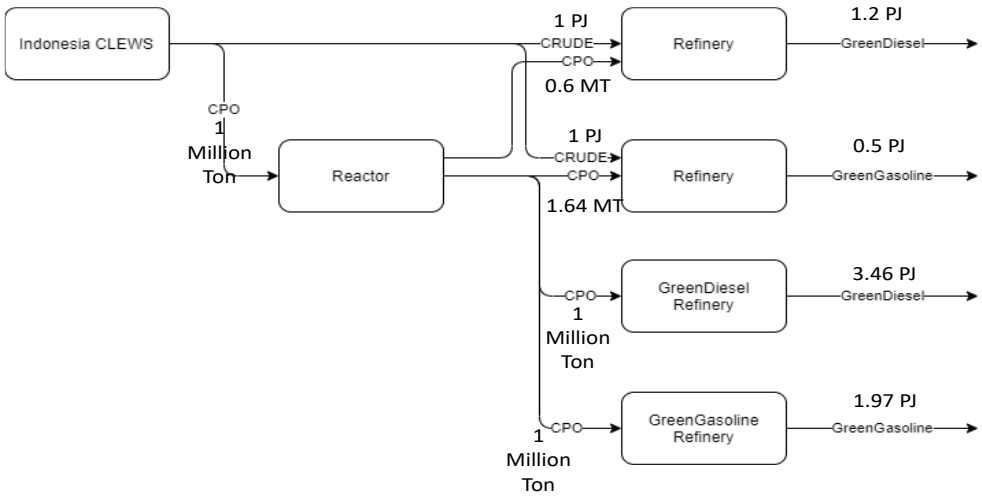


Figure 3. Integration of Indonesia's CLEWs model with Advanced Biofuel Processing
Source: CLEWs Modelling

The land-and-water model is developed based on spatial analysis data taken from Agro-Ecological Zoning (AEZ) by considering the types of crops and water supply. The land-and-water model is divided into seven regions, namely Java, Kalimantan, Maluku Islands, Papua, Sulawesi, Sumatera, and Nusa Tenggara.

3. Results and Discussion

The simulation results and analysis of the CLEWs model of Indonesia are divided into three main groups: energy, land, and climate. The water system in the model is not discussed in this paper, considering that the water supply of oil palm plantations in Indonesia does not use a specific irrigation system. Several studies on oil palm plantations in Indonesia concluded that plants mostly use water in the zone above the plant roots, which means they will only use rainwater and surface water. It is also mentioned that the water footprint of Indonesian palm oil is quite effective. Low agricultural productivity, poor efficiency in water use, and lack of improved technology can cause higher water footprints in primary crop production (Shrestha et al., 2013). As a tropical country with fairly high precipitation, Indonesia has more than enough rainwater to meet the water needs of oil palm plantations.

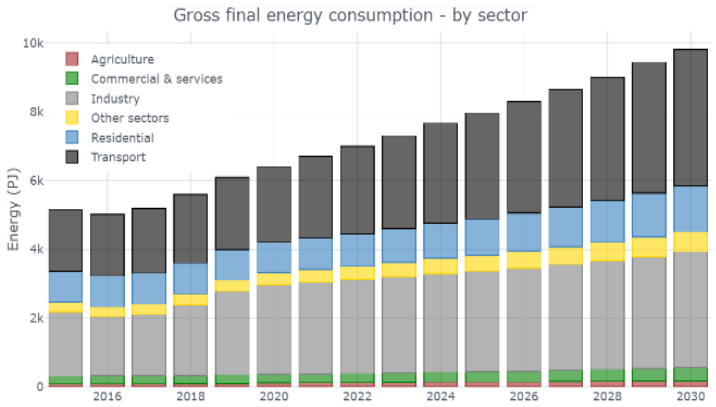


Figure 4. Final Energy Consumption
Source: CLEWs Modelling

The simulation result (Fig.4) shows that the final energy consumption by sectors grows by 4.9% per year. In 2030, the energy demand is estimated to reach 9,800 PJ or increase to almost double from 2015. The transport sector is the second-largest final energy consumer after the industry, which is around 40% of the total final energy consumption. The main strategy to reduce oil fuel consumption is to promote the use of public transport and electric vehicles and shift to biofuels.

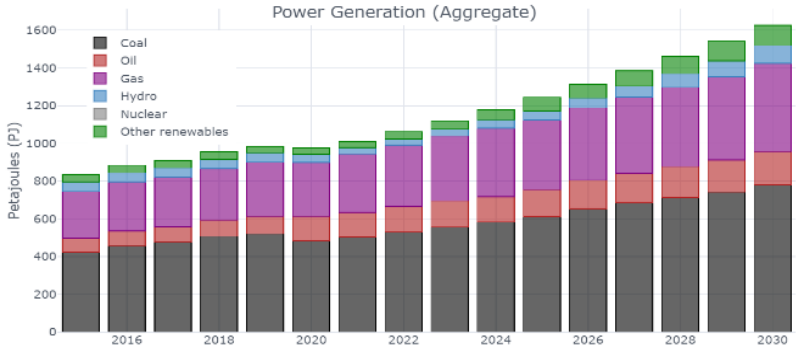
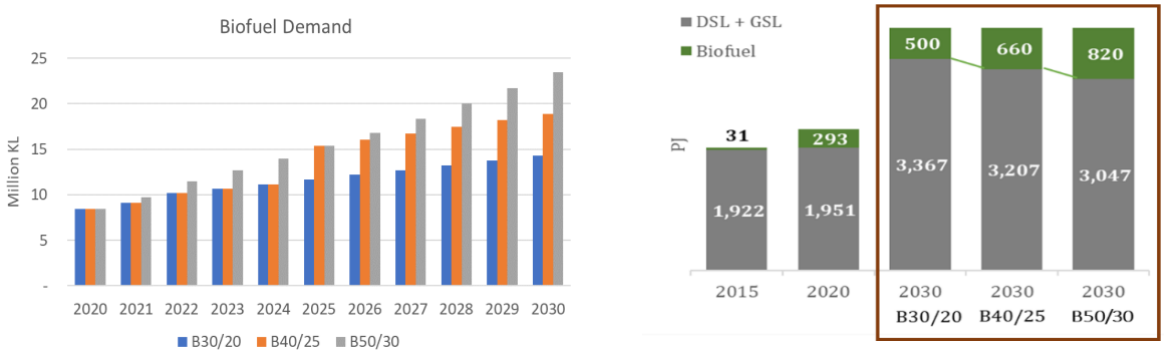


Figure 5. Electricity Production
Source: CLEWs Modelling

Fig.5 illustrates the average electricity growth after 2020, which is 5.3% annually, dominated by the production from coal power plants. Diesel power plants still produce less than 6% of total electricity production. In the future, one of the policies needed to be made is using biofuels in diesel power plants to reduce oil fuel consumption. The scenario developed for biofuels in the transport sector and power generation is similar to the one described in the methodology.



(a) (b)

Figure 6. Biofuel Demands: (a) total fuel demands (b) total biofuel demands
Source: CLEWs Modelling

Figure 6 shows the biofuel demands in the 2015-2030 period. The average growth of biofuel demand is 5.5% under the B30/20 scenario, 8.8% under the B40/30 scenario, and 10.9% under the B50/30 scenario. When the B40/30 scenario implementation starts in 2025, there will be a significant surge in demand for biofuels. This needs to be anticipated to avoid the problems related to the availability of CPO feedstock. Therefore, the implementation of this policy is expected to start 2 or 3 years in advance. In 2030, biofuel demand under the B50/30 will become 24% higher than the B40/25 scenario, and 64% higher than the B30/20 scenario. With the implementation of the current policy, the total demand for biofuel will reach 13% in 2030. Meanwhile, the implementation of the B40/30 scenario will increase the demand by 17%, and by 21% under the scenario B50/30.

The intensification of biofuels under the three scenarios will help reduce oil fuel imports, as shown in Figure 7. The implementation of B40/25 and B50/30 will help decrease oil imports by around 3.7 million KL by 2025 compared to the current policy scenario (B30/20). Under the B40/25 scenario, oil imports will drop by about 4.6 million KL (equal to USD 2 billion saving), whereas under the B50/30 scenario, the imports are estimated to decline by 9.2 million KL (equal to USD 4 billion saving) in 2030. The implementation of the scenario of B50/30 in the long term has the potential to eliminate fuel imports.

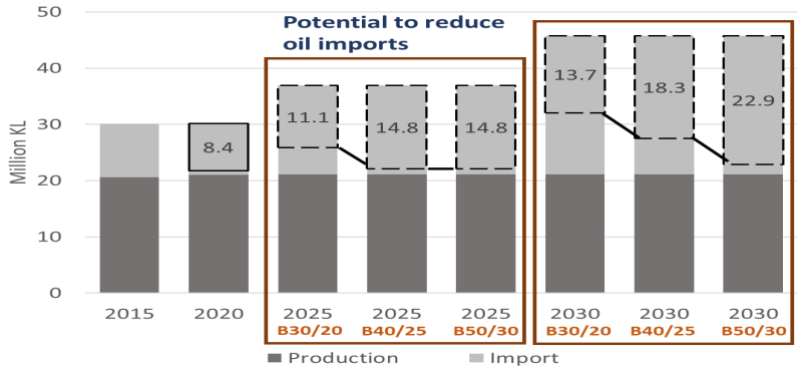
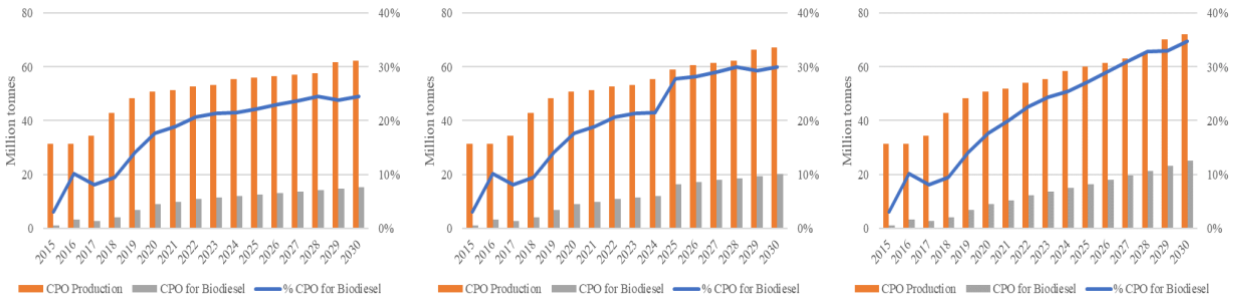


Figure 7. Oil Import Reduction
Source: CLEWs Modelling



(a) B30/20 (b) B40/25 (c) B50/30

Figure 8. CPO Production vs. Biofuel Demand
Source: CLEWs Modelling

Figure 8. highlights the shares of CPO needed to produce biofuel. In 2030, to produce 14.3 million KL of biofuel, 15.3 million tons of CPO or equal to 25% of total CPO production are needed under the current policy. Meanwhile, under the B40/50 scenario, 20.2 million tons of CPO are required (30% of total CPO production) to produce 18.9 KL of biofuel to meet the demand. Under the B50/30 scenario, 25.1 million tons of CPO (35% of the total CPO production) are needed to meet 23.5 KL of biofuel demand. The share growth of CPO for biofuel in the scenario of B50/30 seems to continue to increase sharply compared to other scenarios. In the long term, this can be an issue and needs to be studied further, so that it will not interfere with the need for CPO for other purposes and with the CPO price.

One of the issues of concern in this study is the government's policy for a moratorium on land clearing or expansion of oil palm plantations in the future. It is expected that the increase in the demand for biofuel and other CPO needs will not significantly increase the plantation areas. A strategy to reduce CPO exports is thus required to solve the issue.

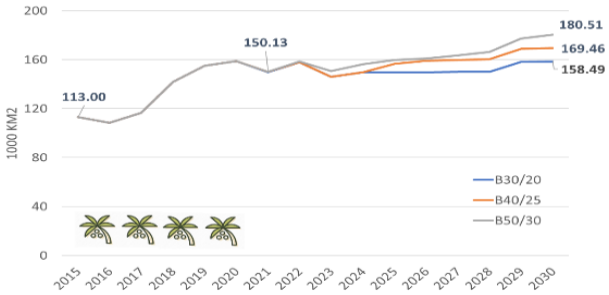
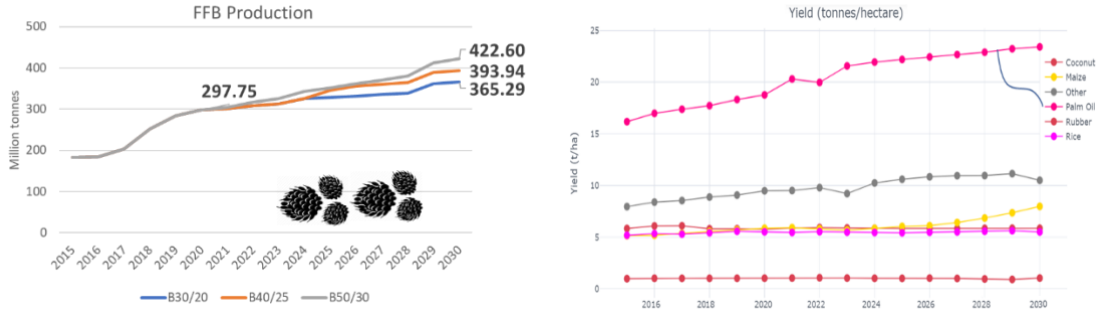


Figure 9. Oil Palm Plantation Areas
Source: CLEWs Modelling

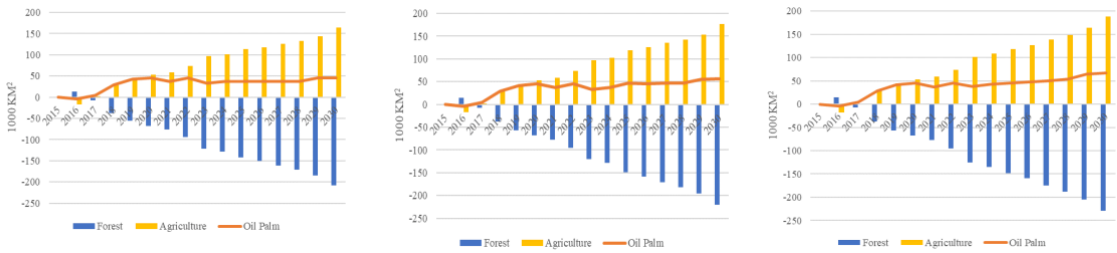
Figure 9. shows the areas of oil palm plantations needed to meet the future CPO needs. By 2030, an area of 8.36 km^2 will be required under the B30/20 scenario, 69.33 km^2 under the B40/25 scenario, and 80.38 km^2 under the B50/30 scenario, compared to the current policy's scenario. If all plantation areas were assumed to have the same productivity, the increased proportion of land demand can be used as a reference to calculate the number of CPO exports that must be reduced if there is no more expansion. Thus, to meet domestic needs, including the need for biofuels, CPO exports must be reduced by 7% in 2030 under the scenario of B40/25 and 14% under the scenario of B50/30 to the total national production of CPO.

In 2030, oil palm production is predicted to increase by about 7.8% under the scenario of B40/25 and 15.7% under the scenario of B50/30, compared to current policy as shown in Figure 10a. There is no significant difference in plantation productivity in the three scenarios. They also have slightly similar trends of yields (Figure 10b). To avoid land expansion for oil palm plantations under the B40/25 and B50/30 scenarios, palm oil yield (FFB) on the existing oil palm plantations shall be increased to above 28 tons/Ha in 2030.



(a) FFB Production (b) Plantation Productivity

Figure 10. Production and Productivity of Oil Palm Plantations
Source: CLEWs Modelling



(a) B30/20 (b) B40/25 (c) B50/30

Figure 11. Accumulation of Forest Diversion
Source: CLEWs Modelling

The results of model simulations related to forests show that most of forest diversion is used for agricultural area expansion (~ 75–80% of forest diversion), as shown in Figure 11 in all scenarios. Under the current policy, 22% of the forest diversion will be used for additional oil palm plantations by 2030. From Figure 11a., it can be seen that in the 2019–2030 period, there are relatively no additional areas of

oil palm plantations, which is in line with the government's policy of moratorium on oil palm plantation expansion. Meanwhile, under the B40/25 scenario, 26% of the forest diversion will be utilized for oil palm plantation expansion, and 30% under the B50/30 scenario by 2030. However, land expansion is still important to meet biofuel needs in the B40/25 and B50/30 scenarios. In terms of water needs, there is no irrigation system required in oil palm plantations; thus, the water system in the biofuel intensification scenario is not specifically discussed in the study.

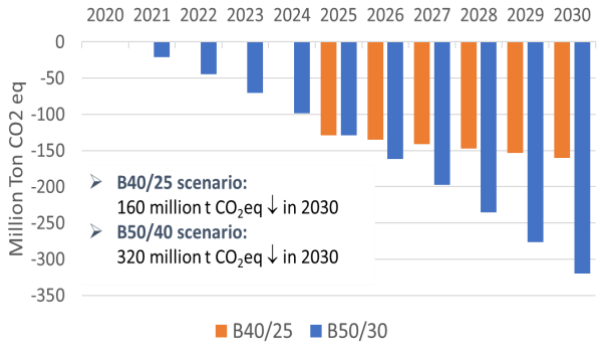


Figure 12. GHGs Emission Reduction
Source: CLEWs Modelling

The implementation of the B40/25 and B50/30 scenarios will help reduce GHGs emissions from fuel combustion by around 160 MTon CO2-eq and 320 MTon CO2-eq respectively by 2030, as shown in Figure 12. However, the emissions from forest diversion to oil palm plantations are not considered in this study. The implementation of the B50/40 scenario can fully meet Indonesia's NDC target commitments from the energy sector for the CM1 (unconditional mitigation scenario) or 80% of commitments for the CM2 (conditional mitigation scenario).

Conclusions

Biofuel intensification in Indonesia, as simulated by the model, can help reduce the country's dependency on fuel imports and increase domestic consumption of CPO. It will also increase energy security and protect the environment as GHGs emissions are also reduced. However, some factors need to be considered before implementing this biofuel intensification. If the cost of biofuel production is higher than the cost of diesel/ gasoline production, there will be some financial issues for the government. Diversion of more forests to oil palm plantations can also be an issue. At the same time, carbon sink areas will decrease. To avoid land expansion for additional oil palm plantations, the yield of FFB or land productivity on the existing oil palm plantation should be increased.

Recommendation

The government needs a policy of biofuel incentives or price mechanism formulation, a policy of land allocation using marginal/critical land for a new oil palm plantation, and a policy to improve the yield or crop productivity of oil palm plants.

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Policy Paper

Strategic Programs to Accelerate Competency Development of Construction Workers

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ABSTRACT

The quality of infrastructure highly depends on the availability of qualified, reliable, and competent and certified construction workers as stipulated in Law No. 2 of 2017. Based on the *Survei Angkatan Kerja Nasional* or *SAKERNAS* (National Labor Force Survey) conducted by *Badan Pusat Statistik* or *BPS* (Statistics Indonesia) in 2021, there are 8,293,769 million construction workers, of which less than 10% have competency certificates. This study aimed to explore the strategies for accelerating the certification of construction workers. A descriptive method with a qualitative approach was used by reviewing and observing existing data from the Ministry of Public Works and Housing, Statistics Indonesia and Construction Services Development Agency. It was found that certification can be accelerated by establishing Certification Agency for Profession (LSP), re-branding and modernizing SIBIMA Construction services, maintaining the quality of experts through continuous professional programs (PKB) and implementing Link & Match to synchronize competency with the needs of the construction industry. It can be concluded that there has been a rise in the number of certified workers but the figures are far from the ideal target. Several factors contributed to this condition, such as lack of finance, synchronization and data harmonization, lack of synergy among the stakeholders in construction services, and lack of technology adoption and information on government policies about training and certification of construction workers.

Keywords: infrastructure, construction workers, competence, certification

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1. Introduction

Infrastructure development is one of the government's priorities to support economic growth locally, regionally, and nationally. This national infrastructure development policy is outlined in various policies such as the National Long-Term Development Plan (RPJPN), the National Medium-Term Development Plan (RPJMN), Government Work Plans (RKP) and the Strategic Plans of Ministries. The acceleration of Indonesian economic development, especially during the pandemic, can be achieved by advancing infrastructure development, which has a strategic role in maintaining the sustainability of Indonesian economic growth to reach an average of 6% - 6.4% until 2045. This is ultimately to conceive the fact that Indonesia will be a developed country by 2045.

In line with the government's program, the Ministry of Public Works and Housing is preparing a development program plan for 2020-2024. The primary budget of the Public Works and Housing Ministry is mainly focused on road access and bridge constructions, water resources, housing provisions, residential area development, construction resource development, and management services.

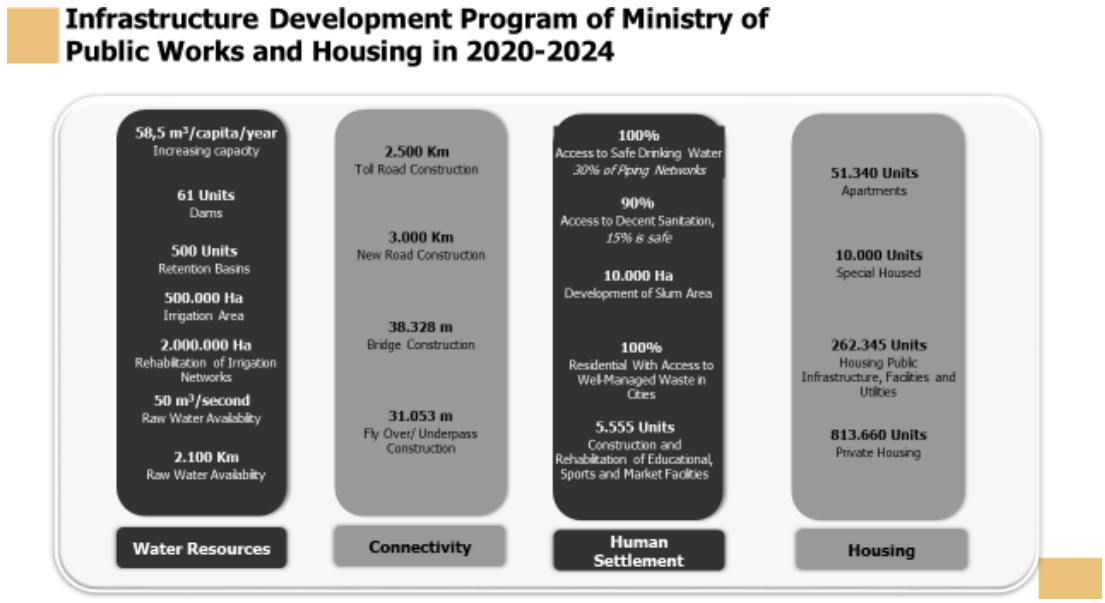


Figure 1. Strategic Plans of the Ministry of Public Works and Housing 2020-2024 (Ministry of Public Works and Housing, 2021)

The construction service sector demands a great number of workers; hence, this is as referred to the results of the National Labor Force Survey (SAKERNAS) by BPS Indonesia in the book of construction in 2021 as shown in Figure 1 above, a total of 8,293,769 million people work in the construction services sector. Consequently, infrastructure development is closely related to human resource development. To build high-quality and durable infrastructure, it is necessary to have competent and qualified human resources in an ideal number. Contrarily, certified construction workers are still less than 10% of the total construction workers.

Based on the Center for Strategic Studies of the Ministry of Public Works and Housing, each infrastructure development worth Rp. 1 trillion can absorb 14,000 certified construction workers. In regards to the national infrastructure budget allocation for 2022, which reaches Rp. 384.8 trillion, the ideal need for certified national construction workers is 5,387,200 people or more than 60% of the total construction workers at all qualification levels. Therefore, there is a large gap between the number of uncertified and certified construction workers.

The Ministry of Public Works and Housing has devised efforts as outlined in policies to accelerate the attainment of certified construction workers. However, these efforts have not been able to increase the number of certified construction workers significantly due to one main problem pertaining to financial supports.

Considering many shortages in an attempt to achieve the ideal number of certified construction workers, the government cannot work alone in implementing the programs. Supports from all stakeholders in the construction service sector are crucial. These efforts can be carried out through policy supports such as providing education, training, competency standards, and the recognition of competence (or certificates).

2. Methodology

2.1 Type and Approach

In relation to the background elaborated in the earlier section, this research employed a descriptive qualitative approach covering spatial analysis of policy and planning documents. Qualitative research is a research procedure that produces descriptive data, either written or spoken words from people and observable behaviour (Bogdan and Taylor, as cited in Moleong, 2006, p. 4). Thus, it is an approach based on facts obtained in the field.

The descriptive method examines the status of a group of people, a subject, a set of conditions, a system of thought, or a class of events in the present. This research used a descriptive method because it is profoundly adjacent to ongoing events and current conditions presented in this article. Arikunto (1992) also explained that if the researcher wants to know the status of something, then the research is descriptive in nature, namely explaining events and other matters.

Moreover, this research used a qualitative approach due to the specifications of the research subject and to obtain in-depth information and cover social realities; accordingly, this research focused on collecting descriptive data as much as possible to be recorded in the form of a report or description.

As this research used a qualitative descriptive approach, the data obtained in the form of words, pictures, or behaviour were analyzed and presented in the form of descriptions in accordance with the authentic situation and conditions.

The descriptive method aims to obtain information about the existing conditions and needs for construction workers and implement policies in the government programs to increase the construction workers' competence. This research focused on the investigation of facts found in observations and on the studying of secondary data. Researchers observed the phenomena that occurred in the field and then illustrated them. Sudjana and Ibrahim (2009) explained that descriptive research seeks to describe something, an event at present. In other words, descriptive research focuses on actual problems at the time of the study.

2.2 Data Sources

This research used secondary data or indirect sources. Data collection was carried out in various settings, sources, and ways. The data can be collected in a natural setting based on the setting. Data collection techniques are the most important stage in research as the main purpose is to obtain data. This research used a purposive sampling technique based on certain criteria. In other words, data were selected based on the relation, relevancy, and validity to construction worker development and improvement of certified construction workers.

2.3 Analysis

The data were collected in an attempt to investigate the current event systematically. Sudjana and Ibrahim (2009) define observation as systematic experiences and recording of the particular studied phenomena. Meanwhile, Hadi, as cited in (Moersalah and Moersanef (1987), defines the observation method as systematically recording the investigated phenomena. Morris (1973, p. 906) defines observation as an activity of recording a symptom with the help of instruments for certain purposes. According to Cholid & Achmad (2009), the observation method is a data collection tool that is carried out by systematically observing and recording the investigated symptoms. This study

Conducted A Literature Review Of Secondary Data Obtained From The Ministry Of Public Works And Housing, The Indonesian Statistics Central Bureau, And The Construction Development Agency (LPJK).

Generally, Data Analysis On Population Economic Activities Focuses On Workforce Allocation. It Is Important To Consider The Quality Of Human Resources (HR), Such As The Workers' Education Level. The Composition Of The Working Population By Education Level Can Provide An Overview Of The Human Resource Quality And An Indicator Of The Human Capital Availability In A Region Or Country. It Is Assumed That The Higher the workers' education level is, the better the work quality becomes.

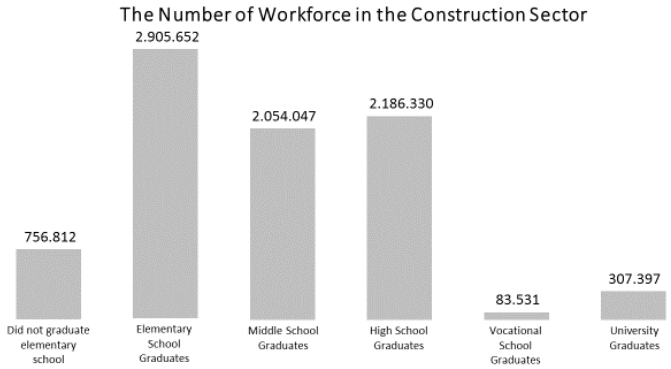


Figure 2. Graph of the Number of Workers in the Construction Sector by Education Level (Badan Pusat Statistik [BPS], 2021)

Table 1. Number of Workers in the Construction Sector by Education Level

TABEL *TABLE* : 37 Penduduk Usia 15 Tahun ke Atas yang Bekerja Seminggu yang Lalu pada Sektor Konstruksi Menurut Provinsi dan Pendidikan, Agustus 2021

Population 15 Years of Age and Over Who Worked During Previous Week on Construction Sector by Province and Educational Attainment, August 2021

Provinsi *Province*	Tidak sekolah/ Tidak tamat SD *No Schooling/Not Yet Completed Primary School*	SD atau sederajat *Primary School*	SMP atau sederajat *Junior High School*
(1)	(2)	(3)	(4)
1. Aceh	5 279	25 255	37 956
2. Sumatera Utara	23 788	82 761	120 845
3. Sumatera Barat	17 768	29 752	33 328
4. Riau	13 911	41 230	35 800
5. Jambi	7 130	26 206	19 077
6. Sumatera Selatan	25 784	63 373	55 446
7. Bengkulu	6 877	13 489	11 939
8. Lampung	23 057	80 264	72 418
9. Kep. Bangka Belitung	5 735	9 475	7 125
10. Kepulauan Riau	5 047	13 822	15 508
11. D.K.I. Jakarta	6 273	29 321	41 460
12. Jawa Barat	103 160	735 814	336 920
13. Jawa Tengah	145 163	599 480	403 965
14. D.I. Yogyakarta	15 531	34 449	35 588
15. Jawa Timur	113 108	500 845	386 139
16. Banten	29 133	134 502	72 731
17. Bali	18 958	45 814	34 192
18. Nusa Tenggara Barat	23 332	42 978	42 119
19. Nusa Tenggara Timur	19 678	52 983	23 365
20. Kalimantan Barat	25 087	49 937	36 300
21. Kalimantan Tengah	6 552	21 755	15 658
22. Kalimantan Selatan	11 389	40 461	23 919
23. Kalimantan Timur	10 539	18 421	23 944
24. Kalimantan Utara	2 405	5 365	3 803
25. Sulawesi Utara	8 190	22 642	25 640
26. Sulawesi Tengah	6 493	26 644	25 377
27. Sulawesi Selatan	41 589	89 854	50 857
28. Sulawesi Tenggara	10 914	22 125	18 706
29. Gorontalo	7 828	9 660	4 502
30. Sulawesi Barat	7 998	13 464	5 786
31. Maluku	1 110	5 715	9 372
32. Maluku Utara	2 159	7 914	8 509
33. Papua Barat	2 418	4 545	6 855
34. Papua	3 429	5 337	8 898
INDONESIA	756 812	2 905 652	2 054 047

Sumber/Source: Diolah dari Survei Tenaga Kerja Nasional (Sakernas) Agustus 2021, BPS
Processed from Labor Force Survey August 2021, BPS-Statistics Indonesia

Lanjutan Tabel / *Continued Table* 37

Provinsi *Province*	SMU atau sederajat *Senior High School*	Diploma I/II/III *Diploma I/II/III*	Universitas *University*	Jumlah *Total*
(1)	(5)	(6)	(7)	(8)
1. Aceh	63 908	841	7 492	140 731
2. Sumatera Utara	150 060	2 367	10 907	390 728
3. Sumatera Barat	43 219	1 753	6 410	132 230
4. Riau	56 254	1 514	6 402	155 111
5. Jambi	28 421	132	3 495	84 461
6. Sumatera Selatan	66 891	1 715	9 407	222 616
7. Bengkulu	15 053	442	1 151	48 951
8. Lampung	71 412	1 480	2 379	251 010
9. Kep. Bangka Belitung	8 807	61	587	31 790
10. Kepulauan Riau	34 077	697	3 042	72 193
11. D.K.I. Jakarta	77 015	4 758	38 402	197 229
12. Jawa Barat	325 556	26 326	62 243	1 590 019
13. Jawa Tengah	296 170	8 827	24 326	1 477 931
14. D.I. Yogyakarta	50 313	1 167	8 399	145 447
15. Jawa Timur	315 551	6 855	27 433	1 349 931
16. Banten	85 982	9 373	26 307	358 028
17. Bali	48 264	1 460	6 773	155 461
18. Nusa Tenggara Barat	60 739	332	5 386	174 886
19. Nusa Tenggara Timur	33 273	1 781	4 591	135 671
20. Kalimantan Barat	34 849	1 027	3 186	150 386
21. Kalimantan Tengah	17 324	314	2 815	64 418
22. Kalimantan Selatan	24 599	1 743	2 875	104 986
23. Kalimantan Timur	36 306	2 403	8 080	99 693
24. Kalimantan Utara	4 640	163	790	17 166
25. Sulawesi Utara	28 455	491	2 950	88 368
26. Sulawesi Tengah	27 554	363	3 213	89 644
27. Sulawesi Selatan	70 883	2 657	12 566	268 406
28. Sulawesi Tenggara	30 890	397	3 535	86 567
29. Gorontalo	6 859	314	583	29 746
30. Sulawesi Barat	9 264	153	703	37 368
31. Maluku	17 371	770	1 409	35 747
32. Maluku Utara	11 046	429	1 661	31 718
33. Papua Barat	10 513	166	3 439	27 936
34. Papua	24 812	260	4 460	47 196
INDONESIA	2 186 330	83 531	307 397	8 293 769

Sumber/Source: Diolah dari Survei Tenaga Kerja Nasional (Sakernas) Agustus 2021, BPS
Processed from Labor Force Survey August 2021, BPS-Statistics Indonesia

Source: BPS, 2021

Based on the results of the National Labor Force Survey (BPS, 2021), the number of workers in the construction sector reaches 8,293,769 people. Then, their education levels varied from

elementary school (2,905,652 workers or 35%), junior high school (2,054,047 workers or 24.8%), senior high school/vocational school (2,186.330 workers or 26.4%), Diploma (83,531 workers or 1%), Bachelor degree (307,397 workers or 3.7%), and not completing elementary school (756,812 workers or 9.1%). Based on these data, the proportion of workers in the construction sector with primary and secondary education levels is higher than those with diplomas and bachelor's degrees.

According to the Center for Strategic Studies of the Ministry of Public Works and Housing, each 1 trillion infrastructure work needs 14,000 construction workers. Thus, with a national infrastructure budget allocation of 384.8 trillion, 5,387,200 certified construction workers are required. Meanwhile, based on the Directorate General of Construction Development data, the number of certified construction workers is only 749,241—consisting of 185,309 experts and 563,932 skilled workers. Referring to the Center for Strategic Studies of the Ministry of Public Works and Housing, there is a shortage of 4,637,959 certified construction workers to achieve ideal conditions.

Figure 3. The Needs for National Construction Workers (Center for Strategic Studies of the Ministry of Public Works and Housing)

3. Results and Discussions

To provide advancement to construction workers, the Ministry of Public Works and Housing—as the supervisor of construction services—has formulated some policies to increase the construction workers' competence. The guidance program for the construction workers for 2020 -2024 emphasizes at developing and improving the system for professional construction workers. To develop the competence of the construction workers, the study discusses some government policies which are justified as having significant impacts on accelerating the certification of construction workers.

3.1 Acceleration of Certification of Construction Workers through Certification Agency for Profession

The definition of competence certification is a job certification required to obtain or improve certain competencies. This certification is a job certification issued by *Lembaga Sertifikasi Profesi* or *LSP* (Certification Agency for Profession) accredited by *Badan Nasional Sertifikasi Profesi* or *BNSP* (National Profession Standardization Agency). Therefore, the existence of LSP is a decisive factor in the success of accelerating the certification of Indonesian construction workers.

The definition and scope of LSP are explained in Article 30 and Article 30A to 30L and Article 176A of Government Regulation Number 14 (2021) concerning the Amendments to Government

Regulation Number 22 of 2020, in regards to the Implementing Regulations of Law Number 2 of 2017, in the matter of Construction Services. Based on Article 30, LSP can be formed by two elements, the Accredited Professional Association and the LPPK—which are under the provisions of the legislation.

According to Bakeri (2021) in the Construction Bulletin, Construction Sector LSP can only be formed by accredited professional associations and currently, approximately 26 professional associations have obtained accreditation. In addition to professional associations, those who can form LSP are LPPK that the minister has registered. Only these two organizations can form an LSP. LSP formed by Professional Associations is categorized as third-party LSP (LSP P3), while LSP formed by Educational and Job Training Institutions (BLK, LPK, SMK, POLTEK and Universities) are categorized as First Party LSP or LSP P1.

In the guidelines for establishing a Certification Agency for Profession (LSP) issued by BNSP Number 2 of 2014, the industry can form a Certification Agency for Profession which is categorized as a second party LSP and a first-party industrial LSP. The main objective of the LSP established is to carry out work competency certification for the human resources of the parent institution. Meanwhile, the main objective of the first industrial LSP established by the industry or agency is to carry out work competency certification for the human resources of the parent institution according to the scope provided by the BNSP.

According to National Profession Standardization Agency (BNSP, 2014), LSP has the function of carrying out Competency Certification and Duties as below:

1. Arranging and developing a certification scheme
2. Creating assessment tools and competency tests
3. Providing assessors
4. Carrying out the certification program
5. Carrying out certification maintenance surveillance
6. Establishing requirements, verifying, and assigning TUK
7. Maintaining the performance of assessors and TUK

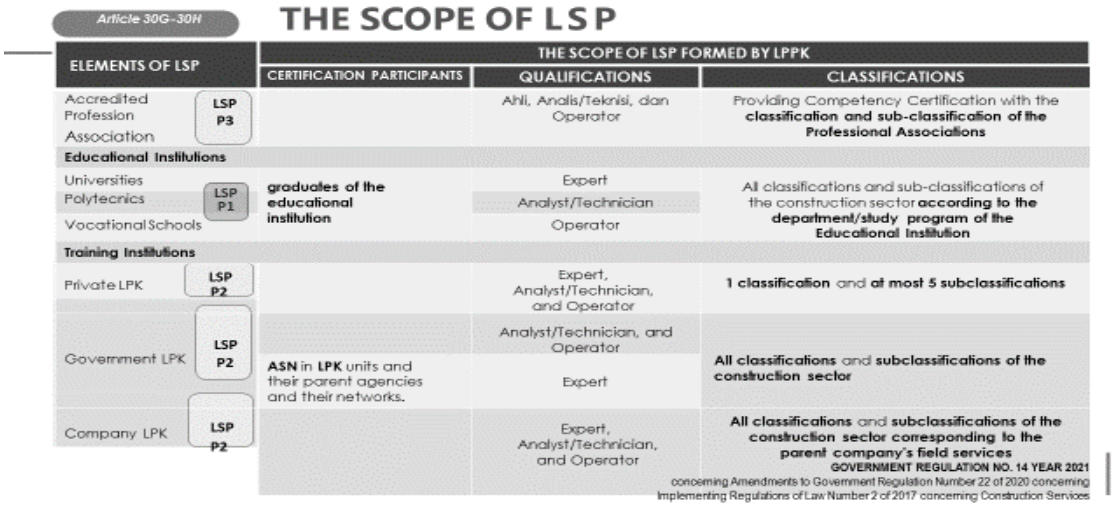


Figure 4. The Scope of LSP (Construction Development Agency, 2022)

Certification Agency for Profession (LSP) has to obtain a license granted through an accreditation process by BNSP stating that the relevant LSP has met the requirements to carry out professional certification activities. The availability of a licensed LSP in the construction sector is limited. The establishment of LSP in the construction sector is encouraged to support the continuity of work competency certification services for all job positions. The availability of a licensed LSP will greatly affect the progress of increasing the certification of construction workers, both in quality and time.

Table 3. The List of Licensed Certification Agency for Profession

Professional Certification Institute	Founder	Classification	Number of Schemes
LSP ASTEKINDO Konstruksi Mandiri	ASTEKINDO	Civil Engineering	104
LSP GATAKI Konstruksi Mandiri	GATAKI	Construction Management	19
LSP PETAKINDO Konstruksi Mandiri	PETAKINDO	Mechanical Engineering	45
PT. ATAKI Konstruksi Indonesia	ATAKI	Civil Engineering	10
LSP HATSINDO Indonesia Teknik	HATSINDO	Civil Engineering	7
Afiliasi Tenaga Infastruktur	ASTTI	Civil Engineering	20

Source: Directorate General of Construction Development, 2020b

3.2 SIBIMA Konstruksi

The Independent Intensive Learning Information System (SIBIMA) for construction is a knowledge management service and competency-based distance training in the construction sector provided for construction workers (contractors, consultants, suppliers and other construction service providers). SIBIMA Konstruksi is a breakthrough in training and certification that utilizes digital media where training and certification are carried out remotely. The primary idea of this system is to provide as much access to learning as possible for construction workers across the Indonesian archipelagos.

Looking at the history of SIBIMA, the concept of e-learning was introduced to the construction sector in 2014. At that time, there was still very little interest. This is natural because people were not used to learning independently. The system started with a mailing list and Facebook group that facilitates coordination for participants to consult about learning materials. During the training, participants were provided with assistance by the instructors by using Facebook groups and mailing lists. At this stage, the exam was still conducted face-to-face, and the training certificate was created conventionally.

In 2015, the Ministry of Public Works and Housing conducted a full trial of distance learning training services for construction workers on the pjjak.net website. On 5 November 2016, this system was refined and named SIBIMA KONSTRUKSI (Independent Intensive Learning Information System for Construction).

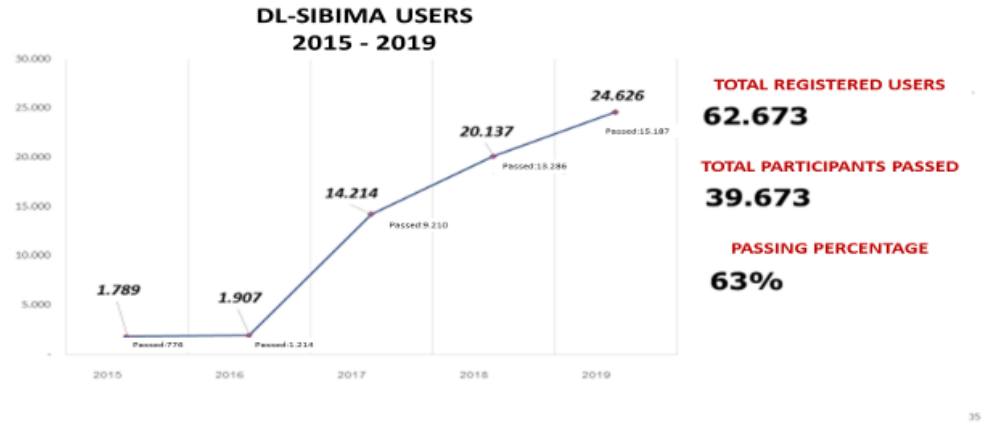
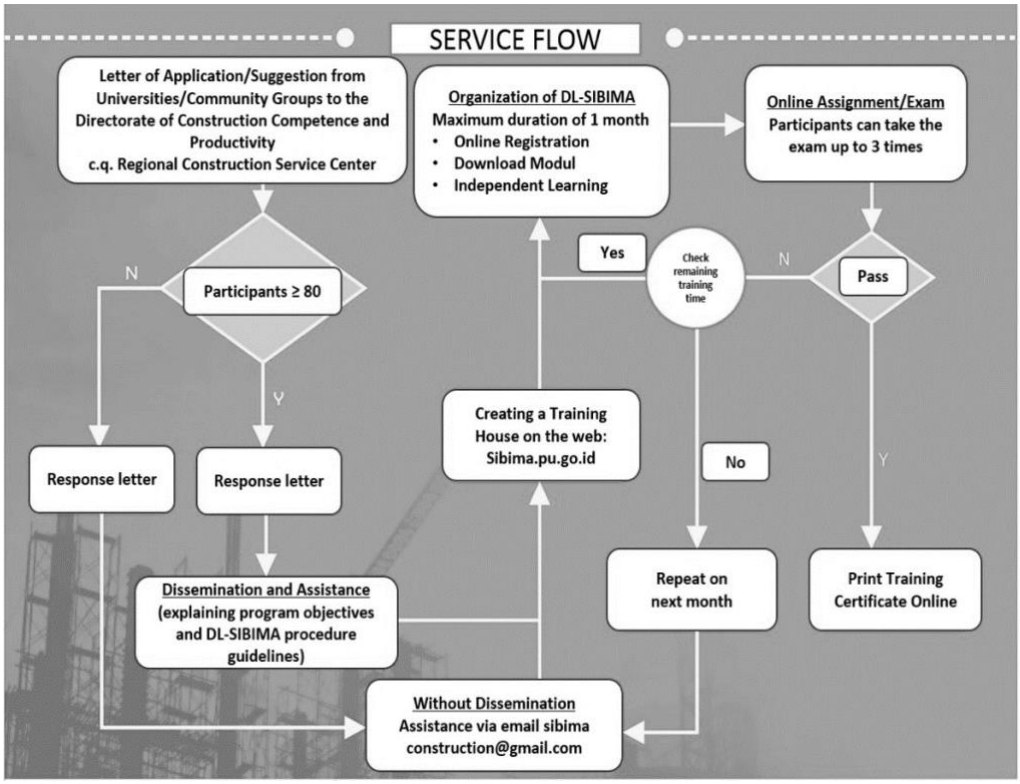


Figure 5. The Implementation and Impact of the Sibima SIGAP Innovation (Directorate General of Construction Development, 2020b)

On 7 July 2017, the pjjak.net website was officially changed to sibima.pu.go.id, the SIBIMA service had become more reliable in terms of security and speed of service. DL-SIBIMA is an independent learning system that is inclusive, easily accessible, cheap, fast, high-quality. It has a maximum capacity and

reaches all corners of the country. In 2015-2018, DL-SIBIMA reduced training costs from Rp. 4.8-11.6 million/person to Rp150-500 thousand/person (saving up to 70%).



Figurer 6. The Service Flow of SIBIMA Konstruksi (SIBIMA Kontruksi, 2021)

The implementation of DL-SIBIMA involves many parties, namely LPJK, universities, construction associations, and provincial governments. Participants who are involved in the DL-SIBIMA training will get a Training Certificate with a learning duration equivalent to 50 hours. The main benefits of the DL-SIBIMA Training Certificate include:

1. For SKA holders (competency certificate) in the construction sector

The DL-SIBIMA certificate has a value of 25 SKPK (Professional Development Credit Unit) points useful for CPD (Continuing Professional Development) for professionals (Lembaga Pengembangan Jasa Konstruksi [LPJK], 2014) in conjunction with LPJK (2017).

2. For S1/D4, fresh graduates
   The DL-SIBIMA certificate for S1/D4 fresh graduates can be used to get the Young Professional competency certification without having to do the 1-year internship. (Circular Letter of the Head of LPJKN No.: 04/SE/LPJK-N/II/2015).

3. For prospective engineering graduates (S1/D4/D3)
   The DL-SIBIMA certificate for prospective S1/D4/D3 fresh graduates can be used as an SKPI (Diploma Supplement).

4. For construction workers
   The KM-SIBIMA is an online library in the construction sector intended for the entire construction service community.

As one of the innovations in fostering digital-based construction workers, SIBIMA has to be welcomed by all parties in the construction sector. However, the branding and information dissemination about SIBIMA to the construction service community is limited.

3.3 Maintaining Competency with Continuousprofessional Development (Cpd) Program

To maintain and improve experts' competence, professionalism, and productivity on an ongoing basis and to fulfil the credit score as a requirement for the extension of the Work Competency Certificate (SKK), construction experts have to carry out or participate in Continuous Professional Development (CPD) activities.

With this competency standard, it is expected that our workforce will have international competence and qualifications to compete openly with foreign workers both domestically and abroad. This is in relation to the implementation of the Circular Letter of the Public Works and Housing Ministry No. 10 of 2019 concerning the Continuous Professional Development Program for Indonesian Construction Workers mandated by the Government Regulation Number 14 (2021) concerning Amendments to Government Regulation No. 22 of 2020 in regards of Implementing Regulations of Law No. 2 of 2017 in the matter of Construction Services.

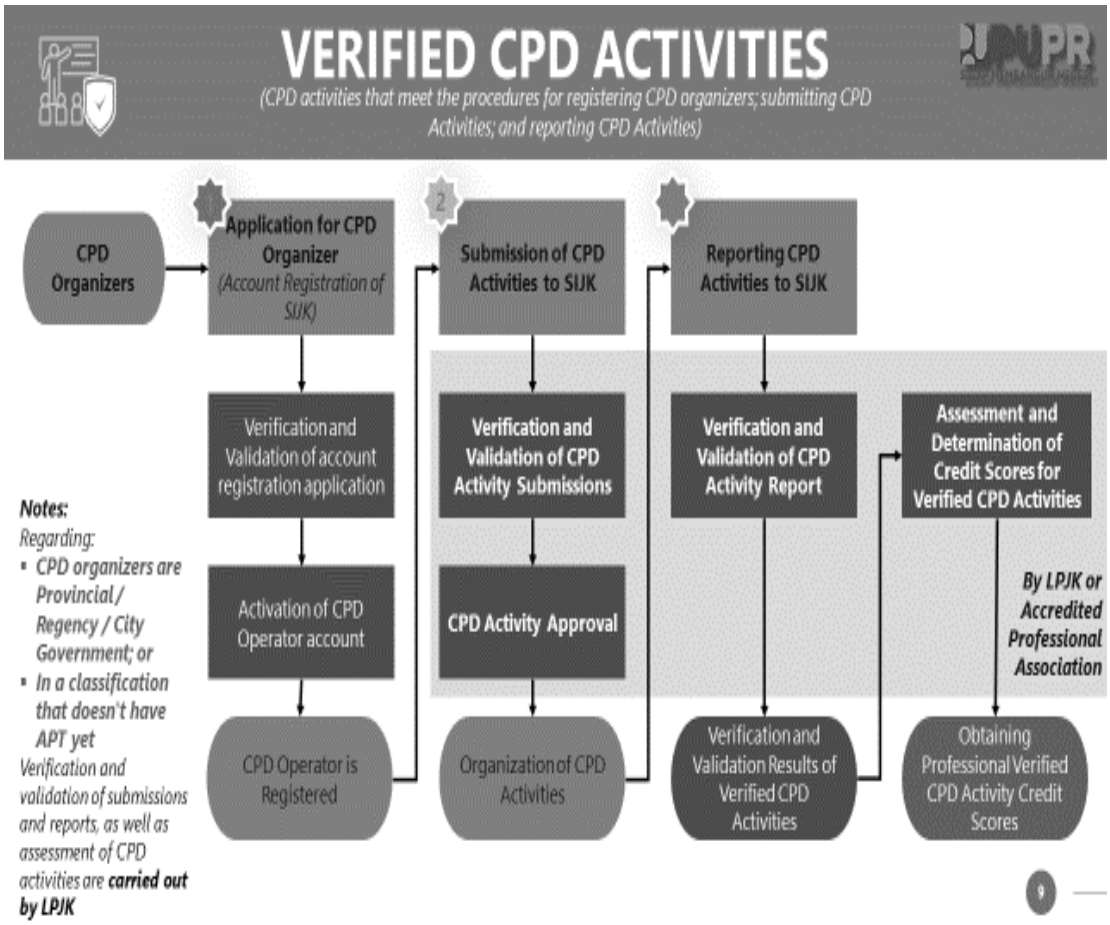


Figure 7. The Activities of Continuing Development Program (Construction Development Agency (LPJK))

Based on the Regulation of the Ministry of Public Works and Housing (2020) Number 13 concerning Organization and Work Procedures of the Ministry of Public Works and Housing, the Directorate of Construction Competence and Productivity carries out functions. One of the functions is the preparation of norms, standards, procedures, and/or competency criteria for construction workers, instructors, assessors, implementation of competency improvement of construction workers, and Continuous Professional Development. The number of expert accounts/Certificate of Expertise (SKA) holders registered at siki.pu.go.id as of 27 December 2021 was 35,049, which is very low compared to the total certified experts.

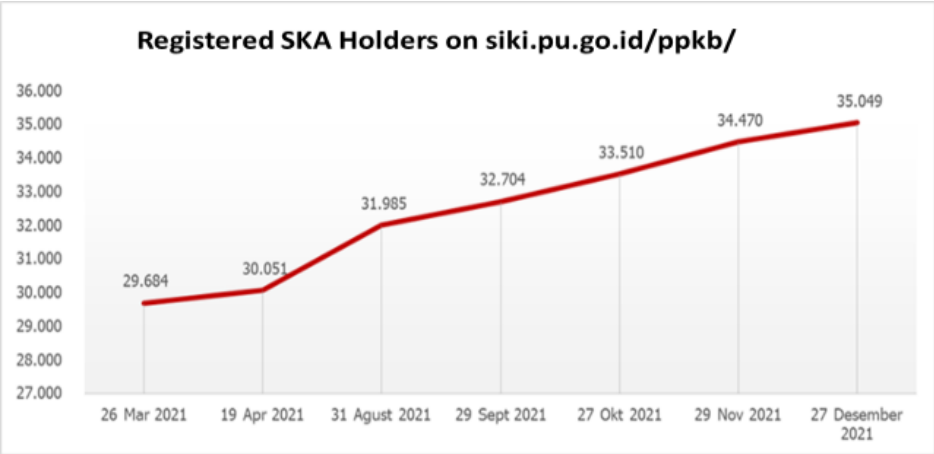


Figure 7. Number of Registered Construction Experts (LPJK, 2021)

CPD activities are organized based on government elements, professional associations/business, entities/construction service supply chains, educational and training institutions, consultants and contractors, assemblers/distributors/applicators of materials and equipment construction, and other institutions or organizations. The number of CPD organizer accounts registered at siki.pu.go.id as of 27 December 2021 was 502 organizer accounts. Then, the number of CPD activities submitted through the CPD application and approved throughout 2021 reached 455.

3.4 Link and Match

One of the strategic issues related to the construction workers is that not all graduates of educational institutions successfully get jobs in the industrial world directly after graduation. This is due to the mismatch of educational institutions in meeting the construction workers' needs following the competencies required in the construction service business and human resources. Around 20% of unemployment in Indonesia is educated, covering Vocational School (8.3%), Diploma (6.9%), and Bachelor (6.2%). One of the causes is the incongruity of competencies the prospective graduates have concerning the needs of the industrial world. A less adaptive curriculum has been assumed not to be able to address the needs of business and industry.

In relation to the link and match program, the Ministry of Research, Technology and Higher Education issued a decree regarding industrial internships and recognition of industrial internship credits on 5 April 2019 (Sihombing 2019). This decree legalizes student apprenticeships in the industry which are valued in the form of credits integrated into the curriculum.

In 2021, through the Directorate of Construction Competence and Productivity, the Ministry of Public Works and Housing had identified the implementation of link and match development at the Regional Construction Service Center. Based on the identification, most of the types of activities of the Construction Service Center are vocational activities, 60.66% of the total activities.

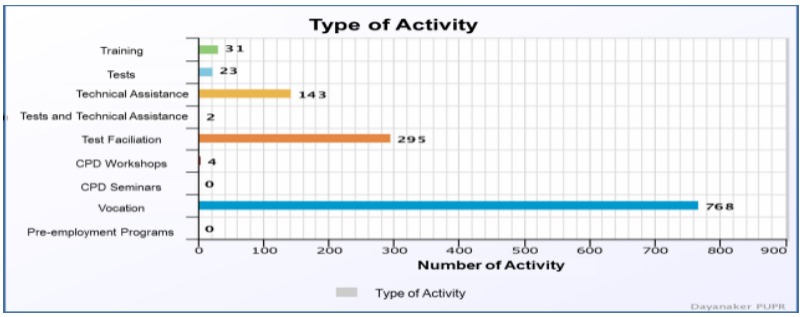


Figure 8. Number of Construction Services Guidance Activities based on the Type of Activity by All Regional Construction Service Centers (Directorate General of Construction Development, 2020a)

Vocational activities carried out by the Construction Services Center are included in the link and match activities because the objects are students and graduates of educational institutions. The Construction Services Center carries out vocational activities following the provisions of the Circular Letter of Director General of Construction Development Number 129/SE/Dk/2020 and Circular Letter of Director General of Construction Development Number 107/SE/Dk/2020.

To create competent construction workers in accordance with the needs of the construction industry, the government, through Regulation of General Procurement of the National Public Procurement Agency (LKPP, 2021) and Regulation of the Ministry of Public Works and Housing (2020), has required construction service providers to win the auction with a value of a budget reaching above IDR 50 billion to transfer experience/expertise in the construction sector through a practical work/apprenticeship system.

In practice, the link and match program receives less attention and lacks commitment from the government, educational institutions, and construction service businesses. The communication between these stakeholders and this program is poor. Thus, it affects the availability of data on the needs of the construction workers.

Conclusions

Based on the results of the analysis of policies to increase the number of certified construction workers, it can be concluded that there is an increase in the number of certified construction workers related to the achievement, target, and program indicators. However, these results are still far from the ideal target number due to various factors such as financial aspects, data synchronization and harmonization, lack of synergy between stakeholders in construction services, less optimal use of technology and information on various government policies in implementing guidance, training and certification programs for construction workers.

Recommendation

Based on the results of the analysis and discussion, the researcher provides the following recommendations regarding the plan to accelerate the certification program for construction workers :

a. It is necessary to build synergy between stakeholders concerning the financial burden regarding the plan to accelerate the certification of construction workers. Currently, the government has allocated substantial funds for the training and certification of construction workers, but it is difficult for the government to work unaccompanied.
b. The government needs to harmonize with various stakeholders of construction services, especially related to mapping the needs of the construction workers. The goal is to achieve effectiveness in implementing construction and certification for targeted construction workers.
c. It is advisable to increase the use of digital technology, which will significantly support the plan to accelerate the construction worker certification, considering Indonesian geography as an archipelagic country.

Recommendations for Certification Agency for Profession (LSP):

In accordance with the mandate of Government Regulation Number 14 (2021) concerning Amendments to Government Regulation Number 22 of 2020 concerning Implementing Regulations of Law, Number 2 of 2017 in the matter of Construction Services, the Certification Agency for Profession (LSP) is believed to be able to increase the number of certified workers significantly. As the supervisor of construction services, the Ministry of Public Works and Housing assists and encourages LPPK to form LSP in accordance with statutory provisions.

In addition to supporting the implementation of accreditation for professional associations, helping registration for LPPK, directing assistance to prospective LSP, and assisting with other regulatory policies, the Ministry of Public Works and Housing can monitor and evaluate LSP in collaboration with the National Profession Standardization Agency (BNSP). Such monitoring and evaluation are expected to maintain the quality of LSP in the construction sector to ensure the implementation of quality competency certification and produce competent construction workers.

Recommendation for SIBIMA:

SIBIMA is quite effective in accelerating the number of certified construction workers. However, it is necessary to improve services, especially in remote areas with limited internet connections. Besides, socialization carried out by the government is necessary for all stakeholders, especially universities and vocational education.

Recommendations for Continuous Professional Development (CPD):

Deliberating the implementation of the Continuous Professional Development (CPD), which is still not optimal, the researcher provides the following recommendations:

a. It is important to support CPD organizers to register for organizer accounts and submit activities through the CPD application so that experts get higher credit scores for verified activities.

b. It is important to support CPD organizers to further improve the implementation of CPD activities both in terms of quality and quantity, such as:

- the Provincial Government in accordance with the main tasks of the Technical Implementation Unit (UPT) of the Provincial Government's construction services.
- professional Associations in accordance with the responsibilities in fostering their members.
- universities in accordance with the scientific centres required for their graduates.
- other interested organizers.

c. It is important to encourage experts to register CPD accounts, participate in CPD activities, and record CPD activities followed in the CPD application to fulfil the credit score as a requirement for the extension of the Work Competency Certificate (SKK).

Recommendations for the Link and Match Program:

a. Additional competencies for graduates and prospective graduates of Vocational High Schools, Polytechnic, and/or Higher Education in the construction sector are crucial to be based on a mutual agreement between educational institutions and service providers. Therefore, the needs of service providers and the curriculum used at educational institutions become the basis for fulfilling competencies to identify additional material required.
b. In realizing vocational activities, besides possessing the latest knowledge and insights in the construction field, instructors need to be continuously levelled by master instructors from service providers.

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Policy Paper

Can Agropolitan Promise Prosperity and Sustainability?

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ABSTRACT

This paper aims to formulate development strategies for agribusiness and agroindustry areas in Kawasan Agropolitan Sendang (KAS) as a development priority area in Tulungagung. It provided alternative KAS development strategies to overcome some obstacles over the last 16 years. Since KAS is one of the national priority development objects, further studies are required to determine the best development planning formulation. The methodology used in this research is a case study method with three analyses, policy analysis, analysis of environmental conditions, and SWOT analysis. The results show that KAS needs to develop the hinterlands and cooperate in providing infrastructures such as banking institutions, markets, and road networks. Farmer groups need to participate in empowerment programs on skill training and improving the quality of innovative and creative agropolitan product standardization and counseling on socio-economic fluctuations that impact people's lifestyles and behavior.

Keywords: Agribusiness, Agroindustry, Agropolitan, SWOT, Tulungagung,

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1. Introduction

The agricultural sector has an important role in national economic development. The agricultural sector contributes to GDP formation, job creation, increasing people's income, and earning foreign exchange. The agricultural sector is considered capable of encouraging regional and local economic growth (Saleh et al., 2017). It can combine growth and equity (growth with equity) or quality growth by minimizing inequality in resource transfer and income between villages and cities (Iqbal & Anugrah, 2009). In addition, agriculture is also an important instrument to reduce poverty (Ahmad et al., 2014; Azril et al., 2010).

Nevertheless, it is undeniable that the agricultural sector also faces threats related to growth stagnation. In the last 10 (ten) years, the growth of the agricultural sector in Indonesia has always been slower than economic growth, except in 2020 (under the pandemic, which tends to be difficult to analyze). The highest growth in the agricultural sector was recorded in 2012 at 4.59, and the lowest growth took place in 2020 at 1.75. The average growth of the agricultural sector in that period was 3.72, below the average GDP growth of Indonesia, which was 4.59.

The classic problems that afflict the agricultural sector almost always revolve around output in raw materials with a low selling value. This happens because development policies in developing countries focus more on exploitation efforts than efforts to create added value and sustainability (Surya et al., 2021). One of the efforts to increase the added value of agricultural production is through the application of agribusiness and agroindustry.

The most relevant referenced definition of agribusiness is constructed by Davis and Goldberg (1957) (as cited in King et al., 2010), the sum of all businesses involved in the production and sale of agricultural products; the production facilities on farms; and the storage, processing, and distribution of agricultural products and items from which they are made. Agribusiness also refers to an economic enterprise that is labor-intensive (Wilson, 2000). Based on several studies, agribusiness development will run effectively if agribusiness managers can gain access to market information, create innovation (Geldes & Felzensztein, 2013), and overcome obstacles related to production costs and market demand (Lusk & Hudson, 2004). Agribusiness also has more complex risks when compared to other similar industries, mainly related to seasonality, supply spikes, and perishability (Behzadi et al., 2017). The agribusiness system is a system for developing agricultural potential based on farm management that prioritizes adding value to agricultural products. It assumes that farmers can take positions as business actors by utilizing existing economic institutions in rural areas. Globally, business activities in the agricultural sector have undergone a radical change towards agribusiness and agroindustry (Cook & Chaddad, 2000).

Agribusiness has a significant role, although mainly in developing countries, the contribution of the agribusiness sector to GDP is not too significant (Luhmann & Theuvsen, 2016). In Indonesia, the agriculture sector has made a significant contribution, but whether the sector still applies traditional agricultural principles or has transformed into agribusiness is still a big question.

Agribusiness and agroindustry are inseparable partners. Reardon and Barrett define agroindustry as the growth of processes, distribution and off-farm activities, organizational changes in the relationship between farmers and processing industries, and changes in product, technology, and market structures in agricultural activities (Cook & Chaddad, 2000). In simpler terms, agroindustry processes raw materials, and raw materials are produced from the agriculture, forestry, and fisheries sectors (Henson & Cranfield, 2009).

To reduce extreme poverty, agroindustry and agribusiness still need to pay attention to socio-economic conditions in the agro-industrial area (Barron & Rello, 2000), with the support of appropriate public policies, ease of capital, and infrastructure networks (Burkaltseva et al., 2017; Tersoo, 2012).

In various parts of the world, agroindustry and agribusiness are among the main weapons for developing countries to catch up with developed countries. This potential arises from a shift in demand for food (Reardon & Busch, 2001). In Indonesia, Chile, Brazil, and Thailand, the role of the agro-industrial sectors reaches one-third of GDP, and in sub-Saharan countries, it is between 20-25% (Wilkinson & Rocha, 2009). However, barriers related to costs, inefficient distribution channels, and market demand have yet to be resolved (Gandhi et al., 2001). In addition, agribusiness is argued to have an important role in developing food systems, especially in poor and developing countries (Wilkinson, 2009).

The development of agroindustry and agribusiness is expected to encourage regional economic growth, increase per capita income and strengthen institutions and community independence (Basuki, 2012). Nevertheless, the development of agropolitan-based agribusiness and agroindustry faces various obstacles and problems. The gap between planning and implementation has resulted in the development

of agropolitan areas unable to increase farmer exchange rates and low community involvement (Azril et al., 2010; Farhanah & Prajanti, 2015; Simanjuntak & Sirojuzilam, 2013). In addition, there are also threats related to environmental damage (Fatkhiati et al., 2015; Rajão et al., 2020; Sharma et al., 2017) and the lack of appropriate procedures applied in regional development (Ikatrinasari et al., 2009), coupled with the lack of knowledge and managerial understanding of area managers (Bannikova et al., 2015).

In simple terms, agropolitan is a regional approach where agribusiness and agroindustry activities are carried out in a connected area. Agropolitan is expected to be the answer to supply chain problems in agribusiness and agroindustry processes. Agropolitan is a regional development concept based on agribusiness and agroindustry activities and is able to become a center for agricultural development activities for the surrounding area (Iqbal & Anugrah, 2009; Manik et al., 2013; Simanjuntak & Sirojuzilam, 2013). The agropolitan concept is also expected to be able to improve the socio-economic conditions of the poor through community and regional-based empowerment programs (Jusoh, 2011; Zainal et al., 2019). The effectiveness of the development of agropolitan areas can occur if the government can facilitate the various potentials as a whole, comprehensively, competitively, people-based, sustainably, decentralized, and community-driven (Basuki, 2012; Ikatrinasari et al., 2009).

Agropolitan development can be realized sustainably if the development program is oriented towards productivity and aimed at natural resource conservation, agribusiness, and agroindustrial development (Pranoto et al., 2006). In addition, it is important to improve rural-urban relations to increase agribusiness productivity in agropolitan areas (Surya et al., 2021; Syarifudin & Ishak, 2020).

For areas where GRDP is dominated by the agricultural sector (Rosiadi, 2020), the development of agroindustry and agribusiness areas, in the form of agropolitan areas, is not a novel issue. The development of the Agropolitan Area in Tulungagung Regency began in 2005 with the establishment of the Sendang agropolitan area called *Kawasan Agropolitan Sendang* (KAS). In the Regional Regulation on the Spatial Planning and Territory (RTRW) of Tulungagung Regency, the agropolitan area include Sendang, Pagerwojo, Karangrejo, and Kauman sub-districts where structurally, the spatial structure of Sendang District is the center of the agropolitan.The other sub-districts are hinterland areas/buffers from agropolitan activities in Sendang District with superior commodities such as dairy farming, horticulture, and tourism.

The government of the Republic of Indonesia stipulates Presidential Regulation Number 80 of 2019 concerning the Acceleration of Economic Development in the Gresik - Bangkalan - Mojokerto - Surabaya - Sidoarjo - Lamongan area, the Bromo - Tengger - Semeru area, and the Wilis and Selingkar areas, Southern Cross. One of the directions of economic development in East Java is the development of agropolitan, minapolitan and metropolitan areas. Tulungagung Regency and other areas around Mount Wilis (Selingkar Wilis) were mandated to develop agropolitan areas.

Even though it has been designed and developed for 16 (sixteen) years, KAS still has some unresolved problems. First, few agro-industrial processes have been developed in KAS. Second, raw materials still dominate production results from KAS. Third, the number of human resources managing agriculture is declining, a classic problem in agropolitan areas and the entire agricultural sector. The use of technology to support the economic transformation of the agricultural sector is still limited. The impact of environmental damage is still neglected.

Efforts to maximize the agricultural sector's contribution to the development of the Tulungagung area were realized through the KAS policy, which was eventually adopted as one of the national priority projects and regional priorities. Several policies to develop and maximize the existing potential over the past 16 years have not resolved some of the classic problems and failed to make any meaningful developments. Therefore, it is necessary to formulate various applicable policy strategies, including physical, economic, and social analysis. The results are expected to provide a comprehensive formulation and capture every problem and policy strategy that can be used to develop this region significantly. In a broader scope, the results of this study are expected to provide practical contributions to national policies based on regional needs.

2. Methodology

2.1. Data Source

There are two types of data required for further analysis process:

a. Secondary data

Secondary data is obtained from secondary survey activities originating from local government agencies and other institutions related to agropolitan development. Secondary data is used as initial data that can provide an overview of the condition of the research object.

b. Primary data

This primary data is obtained from primary survey activities, either from the field observations or interviews with the community or local government agencies. The use of primary data is intended to obtain information that is actual and directly found at the research site while at the same time confirming the initial picture obtained from secondary data. The types of primary data required include:

1. The physical condition of the planning area which is a direct review of the topography, the quality and quantity of infrastructure, the use of existing land, and the use of technology;
2. Economic conditions in the form of dominant sectors that are the main livelihoods of the community in the planning area, including support for regional development policy programs/activities at the planning location, product marketing mechanisms, and financing;
3. Social conditions of the population, especially human resources, both internal and external partnerships in agropolitan development;

2.2. Analysis Method

The data will be analyzed in two stages: the policy and development analysis of KAS and regional environmental condition analysis, which includes analyzing physical, economic, and social conditions. The last is SWOT analysis used to determine alternative policies and strategies that can be taken in regional development.

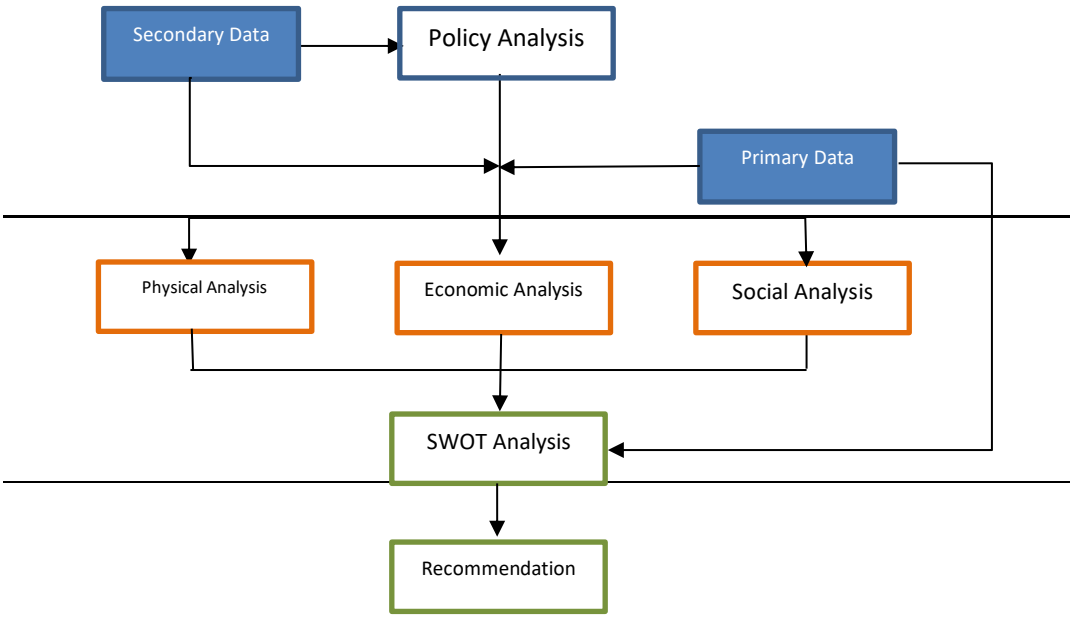

Figure 1. Analysis method framework

a. Policy Analysis

James E Anderson defines public policy as a program design developed by the government (Suwitri, 2008). Thus, policy analysis is an important method to help decision-makers obtain the right information (Safitri et al., 2021). Public policy in agriculture almost always poses a dilemma on the conflict between growth and equity and between productivity and

sustainability (Simatupang, 2003). Because this research is a policy paper, policy analysis is a fundamental analysis that will provide greater practical implications for stakeholders and practitioners. In this study, policy analysis is carried out based on the policies and regulations issued by the government related to the development of agropolitan areas in the field of spatial and development planning.

b. Environmental Condition Analysis
   Analysis of environmental conditions aims to get an authentic and factual description of the physical, social, and economic conditions of KAS and the possibility of differences with the secondary data obtained previously. Environmental condition analysis was carried out in three stages, the analysis of basic physical conditions to determine the physical capabilities of the area (Basuki, 2012), the economic analysis to find out the economic activities of the regional community, and the social analysis to determine the social condition of human resources in the agropolitan area.
c. SWOT analysis
   SWOT analysis is used to follow alternative strategies based on four indicators of strengths, weaknesses, opportunities, and threats (Rangkuti, 2011). In this study, a survey of these indicators was provided by distributing and filling out questionnaires to stakeholders related to the development of agropolitan areas. The sampling of the questionnaires used the purposive sampling method, where about 20-30 people consist of a) 5 government employees from related agencies and b) about 25 heads or members of farmer groups, groups of farmer groups, and farmer cooperatives in the KAS area will be the research sample. Five government officials come from the Tourism Agency, Animal Husbandry Agency, Agriculture Agency, Public Works and Spatial Planning Agency, and Regional Development Plan Agency. These people were selected as research respondents on the grounds of their close involvement as policymakers and actors in agribusiness and agroindustry activities in KAS.
   The questionnaire contains statements on the four factors that form the SWOT analysis, such as "KAS has adequate resources," "KAS has a good and well-maintained supporting infrastructure," "Human resources who manage KAS have been trained, and professional," and "Policies made by the government has taken into account the aspirations of KAS stakeholders." The answer choices for the questionnaire consist of 5 scale options starting from strongly disagree to strongly agree. Data collection was carried out between October and November 2021 through online and in-person interviews. Direct interviews were prioritized for respondents from KAS managers to dig deeper and gain more detailed information about KAS management from a community perspective. Rating values were obtained from the questionnaires filled by the stakeholders. The accumulated total score of strengths (strengths) is reduced by the accumulated total score of weaknesses (weaknesses), while the accumulated total score of opportunities (opportunities) is reduced by the accumulated total score of threats (threats). The final result of the analysis is a diagram showing the position of the strategic options in four Cartesian diagram

3. Results and Discussions

3.1. Policy Analysis

The Acceleration of Economic Development in East Java Province as contained in the Master Plan for the Acceleration of Economic Development for the Gresik - Bangkalan - Mojokerto - Surabaya - Sidoarjo - Lamongan area, the Bromo - Tengger - Semeru area, and the Selingkar Wilis and Southern Cross Areas are an integrated part of the national development areas and planning. The Master Plan is not intended to replace existing development planning documents such as the National Medium-Term Development Plan (RPJMN), Regional Medium-Term Development Plan (RPJMD), East Java Provincial SpatialPplanning and Territory (RTRW) 2011-2031, but to become an integrated and complementary special document to accelerate economic development in East Java Province. In the 2020-2024 RPJMN, which is the mandate of the 2005-2025 RPJPN, in efforts to optimize infrastructure connectivity and economic equity, the direction of national development has been oriented towards creating high, inclusive, and competitive economic growth; regional-based development to reduce inequality;

improving the quality and competitiveness of human resources who are intelligent, adaptive, innovative, skilled, and with character; and strengthening infrastructure based on regional needs and advantages.

Support for the development of economic growth centers is also contained in the RTRW of East Java Province for 2011-2031, where the economic development is directed at increasing high and sustainable regional competitiveness through the development of agropolitan, minapolitan and metropolitan systems. East Java Province's regional development policy is strengthening the urban PKN system as a metropolitan area and increasing linkages to the main production centers in East Java Province, with processing and marketing centers as the core of developing agropolitan and minapolitan systems.

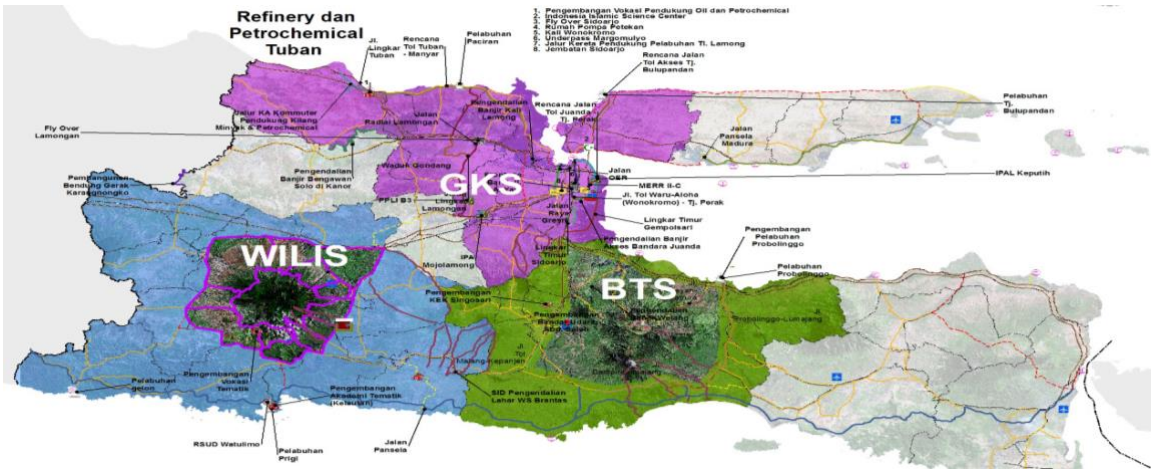

Figure 2. Concept of Regional Development in East Java Province (Presidential Regulation Number 80/2019, 2019)

The Priority Areas for the Wilis and South Cross Areas include the City of Kediri, Kediri Regency, Nganjuk Regency, Blitar City, Blitar Regency, Tulungagung Regency, Madiun Regency, Madiun City, Ngawi Regency, Magetan Regency, Ponorogo Regency, Trenggalek Regency, and Pacitan Regency with the main focus on agro-production, agroindustry, and the tourism sector. The development of the Selingkar Wilis and Lintas Selatan Priority Areas aims to add value to agroindustry and developing agropolitan. This goal is based on the current economic conditions, providing the highest economic contribution in East Java Province. The development of these areas focused on increasing the production and productivity of horticultural agriculture, plantations, and value-added agroindustry, especially in plantation, horticultural commodities, biopharmaceuticals, and the development of agropolitan areas as centers of economic growth in rural areas. In addition, tourism development based on agro and other natural resources (i.e., geoparks) is expected to leverage the development of other economic sectors, supported by increased human resources, increased accessibility, and other supporting infrastructure while ensuring environmental sustainability.

The realization of the priority economic activities included in the agropolitan/minapolitan program is oriented towards (a) Cocoa Development (5,800 hectares); Cocoa and Arabica Coffee Processing Facilities (500 hectares); Coffee Processing Facilities - Ponorogo Regency, Madiun Regency, Pacitan Regency, Tulungagung Regency, Trenggalek Regency; (b) Development of Agropolitan and Agroforestry Sendang – Tulungagung Regency; and Development of Minapolitan Gondosuli-Klatak - Tulungagung Regency.

Based on the RTRW of Tulungagung Regency in 2012-2032, the Selingkar Wilis Area is a strategic area essential for economic growth in both East Java province and Tulungagung districts. This selection is based on the consideration that the area:

a. has the potential for a fast-growing economy;
b. has a leading sector that can drive the district's economic growth;
c. has an export potential;
d. has an activity center that influences sector and regional development;
e. can accelerate the growth of underdeveloped areas;
f. has a function to maintain the level of food production to realize food security due to its status as a Sustainable Food Agricultural Area (KP2B);

g. can accelerate the growth of underdeveloped areas within the district;

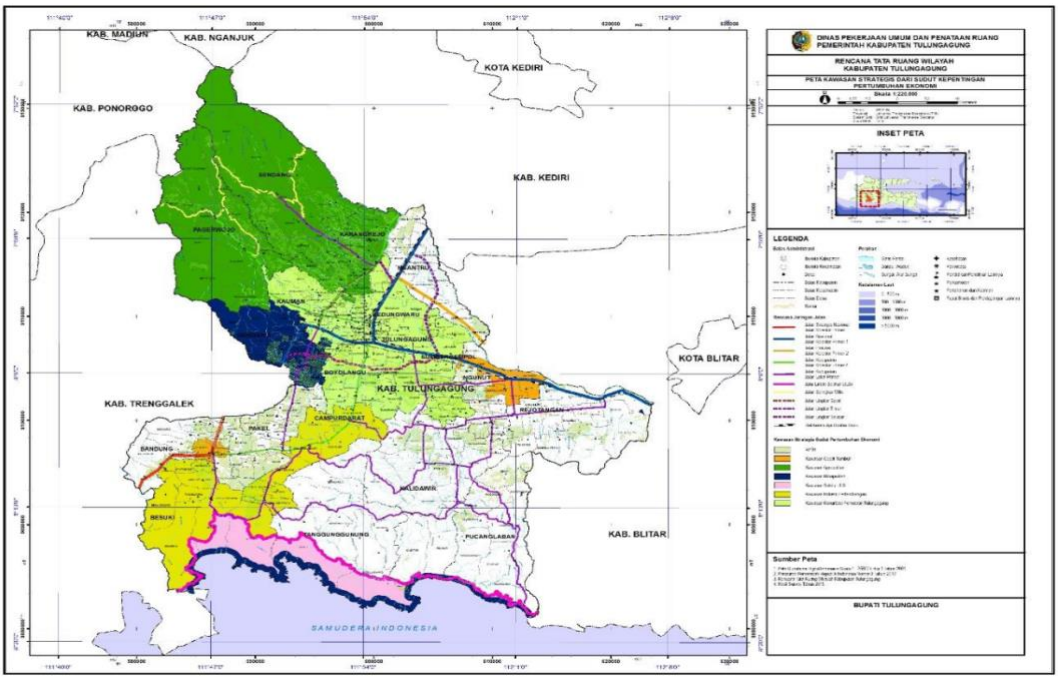

Figure 3. Strategic Area in Tulungagung Regency (RTRW Tulungagung Regency 2012-2032, 2012)

The urban system of the area mentioned above can be in the form of economic centers, new city plans, new economic nodes, and/or new economic corridors needed to maintain space balance, sustainable development, and community resilience. The area's delineation directed as an agropolitan development includes Sendang District and Pagerwojo District. Hierarchically, Sendang Urban and Pagerwojo Town function as Regional Service Centers (PPK) and the surrounding villages function as Local Service Centers (PPL). Thus, the hierarchy in the development of agropolitan areas is in accordance with the direction of the district spatial structure, tiered from PKW, PPK, to PPL. In addition, the hierarchy has a connection with the urban hierarchy in other districts that are included in the Selingkar Wilis Area.

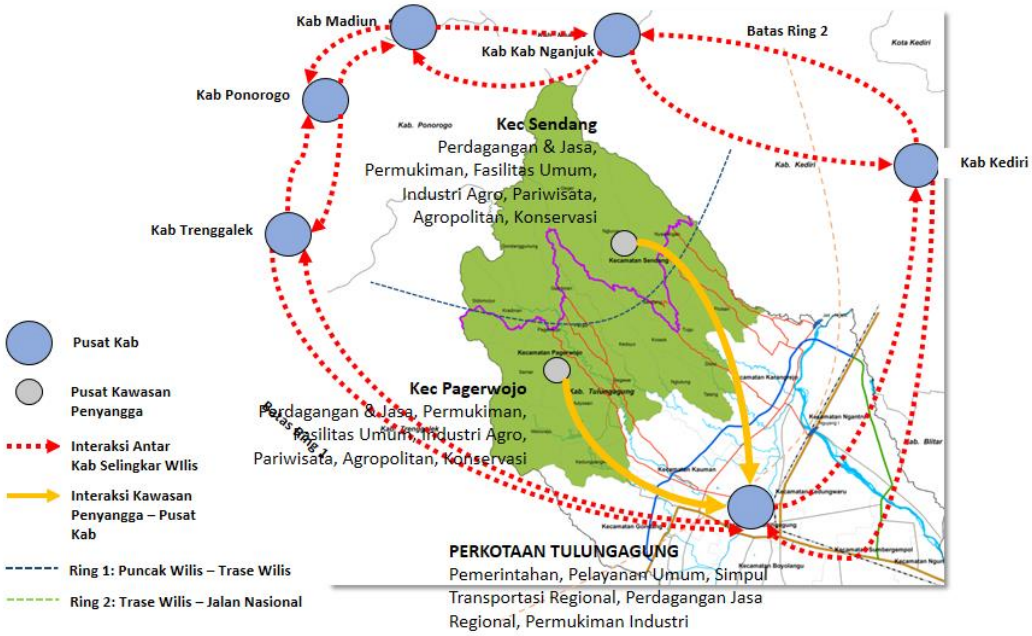

Figure 4. Spatial Structure Around the Wilis Circle Area

Furthermore, if we look at the direction of the spatial pattern, the development of the agropolitan area is also appropriate because it is dominated by cultivation areas such as production forests, community forests, plantations, food crops, and dryland agriculture. However, it should be noted that the agropolitan area is also a protected area in the form of protected forest and water absorption areas. Thus the development carried out should still take into account the carrying capacity and capability of the land.

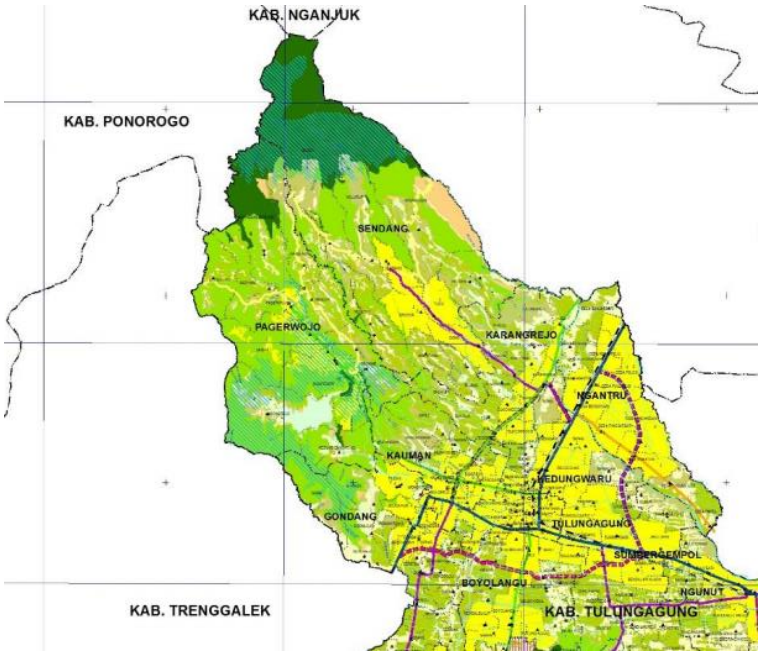

Figure 5. Patterns of Space Around the Wilis Circular Area

Figure 5 shows detailed directions related to using spatial patterns in the Tulungagung Regency that are allowed, allowed with conditions, permitted, and prohibited in each RTRW substance following the development policies and dynamics. General Provisions for Zoning Regulations (KUPZ) for the areas are generally classified into protected areas and cultivated areas. Several zoning regulations for protected areas immediately related to agropolitan development include KUPZ for protected forest areas, water catchments, and river boundaries. Meanwhile, the zoning regulations for cultivation areas immediately related to agropolitan development include KUPZ for production forest areas, community forests, food crops, horticulture, plantations, livestock, and tourism (RTRW Kabupaten Tulungagung 2012-2032, 2012).

Meanwhile, in the regional development planning document contained in the 2018-2023 Tulungagung Regency RPJMD, the development of the agropolitan area is based on the second and fourth missions related to economic and infrastructure development (Tulungagung Regency Regional Medium Term Development Plan 2018-2023, 2018). Mission 2 is "to encourage the strengthening of people's economy based on local wisdom and regional potential, while Mission 4 is " to build quality infrastructure for peripheral areas in achieving equitable development." Thus, the optimization of the economic potential of the Tulungagung Regency must be supported by reliable infrastructures which will eventually improve the distribution of goods and services, support economic growth, and increase the distribution of development results.

The previous agropolitan study was carried out in 2004 with the title Masterplan for the Agropolitan Region of Tulungagung Regency. The purpose of the study was to develop a master plan for agribusiness development with a scope of spatial structure plans, land use/use, physical needs (facilities and infrastructure), nonphysical needs (institutions related to agribusiness), stakeholder empowerment, agribusiness development policies, and selected agropolitan areas. In determining the location of an agropolitan area, it should be selected based on criteria, physical, access to service coverage, complementation and synergy with regional spatial regulations. Thus, Sendang District is designated as the location of the Tulungagung Regency Agropolitan Area with the name Sendang Agropolitan Area (KAS). The leading commodity development plan consists of (1) tropical exotic fruit horticultural commodity development; (2) vegetable horticultural commodity development; (3) food crop commodity development; (4) goat/sheep commodity development; and (5) development for dairy cattle and beef cattle.

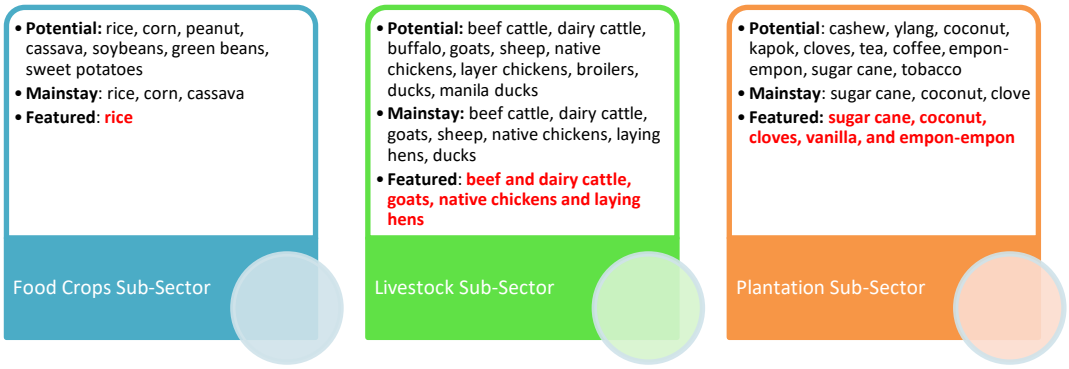

Figure 6. Leading Commodities in the Agricultural Sector (Agripolitan Area Master Plan, 2004)

Based on the various policies mentioned above, it can be concluded that the development of the Tulungagung Regency Agropolitan Area is in line with the planning concept at the national, provincial, and district levels. The essence of the planning concept is how the development of the Tulungagung Agropolitan Area can be accelerated to increase economic growth in the Selingkar Wilis Area and spur the development of the surrounding area. The Government of Tulungagung Regency can realize this by developing infrastructure. The allocation of infrastructure development budgets must also be integrated, meaning that the development of the Tulungagung Regency Agropolitan Area may be cross-sectoral to achieve the same goal.

3.2. Environmental Condition Analysis

3.2.1. Analysis of Basic Physical Conditions

The KAS of Tulungagung Regency, which is located in the north, is the southeastern part of the Wilis Mountains. The altitude in the area ranges from 200-700 meters above the sea level. These topographic factors also support a growing climate in cooler and wetter air, which is good for food crops and plantations. Meanwhile, if viewed from the geology of the rocks that make up the area, the agropolitan area is dominated by intermediate volcanic turf rock types. There are at least three types of soil in the area, brown Mediterranean soil, reddish-brown lithosol soil, and andosol soil; all of which are relatively fertile as the remnants of volcanic materials in the past.

Based on the type of existing soil and its relationship to land use, it should be noted that the chemical and physical properties of the local soil can later be used to increase soil productivity as optimally as possible. Lithosol soils have shallow effective depth due to the undulating topography, and the slope of the soil is more than 40%. So this area is expected to be planted with perennials that have high economic value and, at the same time, function as protective plants and root zones for water management.

Figure 7. Existing Land Use in Agropolitan Area

Land use is dynamic, meaning that land use can change depending on the dynamics of existing development. In preparing the plan, it is necessary to pay attention to the facts of the existing area, including the current land use, so that the allocation of planned activities follows the potential and carrying capacity of the region.

Currently, there is no latest data on land use in the KAS of Tulungagung Regency, including the detailed amount of each land-use dynamics. However, it can be ascertained that the existing conditions have resulted in inappropriate land-use patterns. For example, the cropping patterns in production forests and community forests are no longer for perennials but seasonal crops and are prone to erosion. The planting method with a terracing pattern often does not include a suitable water distribution mechanism, causing landslides. In the future, this must be a concern because, in the agropolitan area, there are also protected areas in the form of protected forests and water catchment areas.

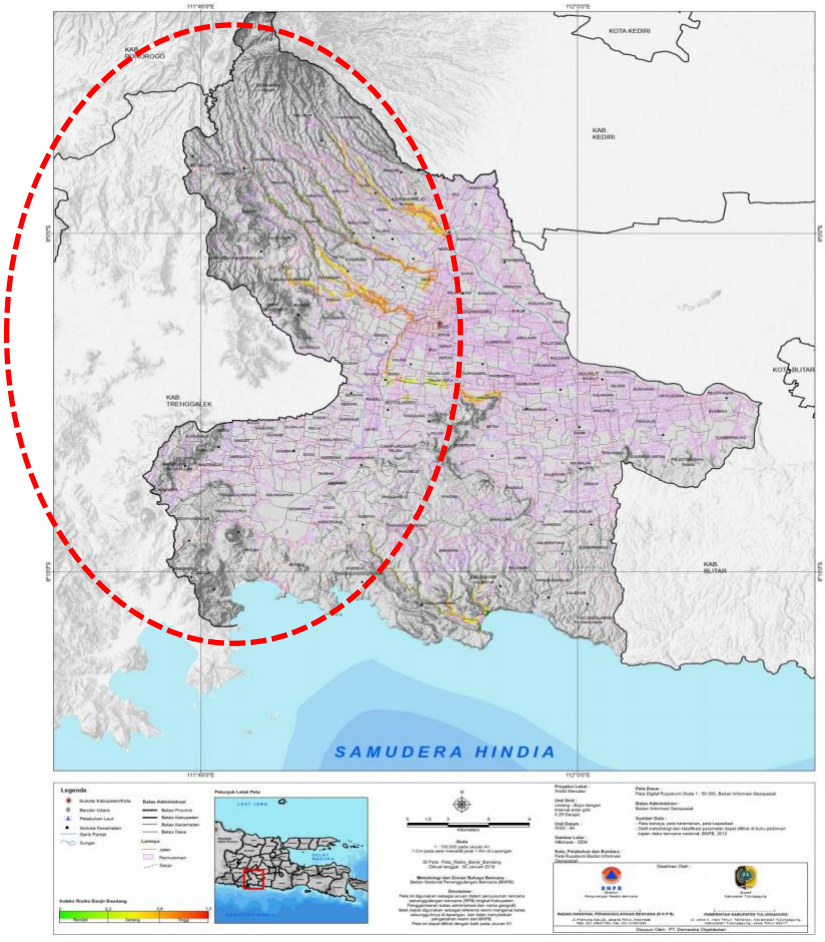

Figure 8. Flash Flood Disaster-Prone Areas (Tulungagung Regency Disaster Risk Study, 2019)

Based on the Tulungagung Regency Disaster Risk Study 2019-2023 (Source: BPBD Tulungagung Regency), the KAS is also an area with the risk of flash floods and landslides. Several factors trigger the disaster: geological and soil aspects, hydrological and climatological aspects, topographical aspects, and land cover aspects (vegetation). Farmers who use nature irresponsibly also contribute to the risk.

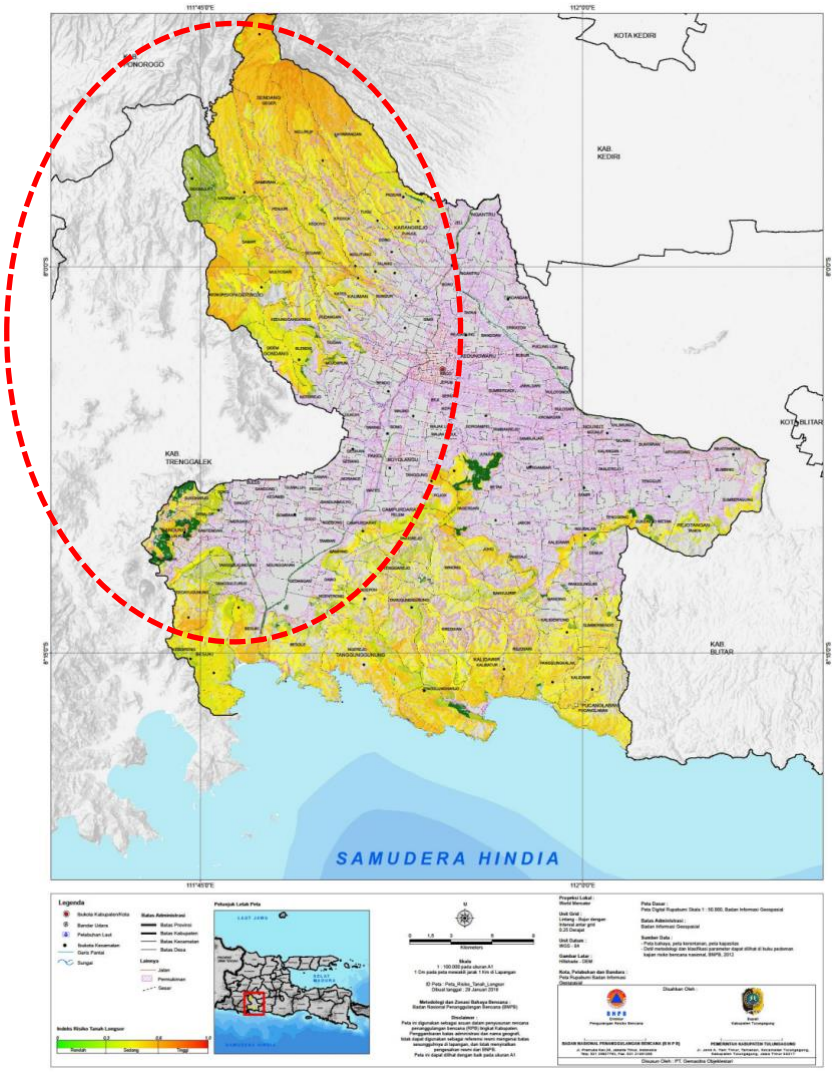

Figure 9. Landslide Prone Areas (Tulungagung Regency Disaster Risk Study, 2019)

Based on the explanation of the primary physical conditions above, it can be concluded that the development of the Tulungagung Regency Agropolitan Area in addition to promising economic growth potential, can also be a threat if the area is used excessively. Threats at several locations indicate that land-use changes from perennials to horticultural crops may cause landslides and flash floods. The land used to catch water cannot function properly due to different plants. In the dry season, the water discharge produced by this area's water sources is reduced or even completely dry. Therefore, land use in agropolitan areas must be suitable and capable of reducing the risk of disasters in the future.

3.2.2. Analysis of Economic Conditions

The largest GRDP contributor to Tulungagung Regency in 2020 is the manufacturing sector, with 22.33% of the total GRDP. The second-largest sector is wholesale and retail trade; car and motorcycle repairs contributed 19.74% to the GRDP, and the third sector was the agriculture, forestry, and fishery sector with 19.51% of the total GRDP. The picture of the GRDP contributor indirectly positions the KAS in its contribution to shaping the economic structure of the agriculture, forestry, and fisheries sectors in the Tulungagung Regency. The people's economic activities in the Tulungagung Agropolitan Region (Sendang

District, Pagerwojo District, Karangrejo District, and Kauman District) are very representative of the characteristics of the region. Sendang and Pagerwojo sub-districts which are located in the highlands, tend to develop the agricultural sector of food crops, horticulture, and animal husbandry. Karangrejo and Kauman sub-districts are located at the foot of Mount Wilis, so the community's economic activities are more varied and tend not to be in the non-agricultural sector.

Based on the description of the economic conditions above, it can be concluded that Sendang and Pagerwojo sub-districts are the centers of regional growth. Meanwhile, Karangrejo and Kauman sub-districts act as buffer zones and agroindustry development. The regional growth center is an agribusiness service area for a buffer zone. The system is related to the existing accessibility and will be built according to need. As an economic area, the existing physical facilities and those to be built are attracting factors for agribusiness activities in the surrounding area.

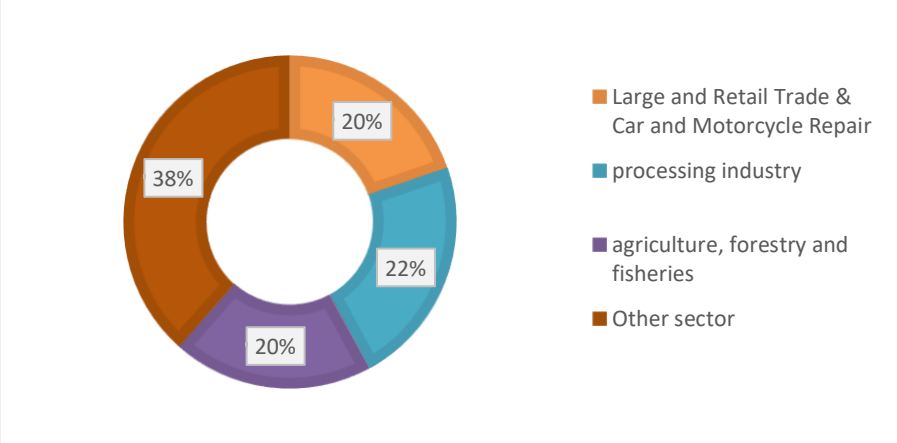

Figure 10. Sector Forming GRDP Kab. Tulungagung Year 2020 (Badan Pusat Statistik [BPS], 2021)

3.2.3. Analysis of Population Social Conditions

Referring to the 2020 Population Census Results, the highest population in the KAS is Kauman District (BPS, 2021). The population of Kauman District is 51,776 people, consisting of 25,951 male residents and 25,825 female residents, with a population density of 1,676 people/km2. In the second position is Sendang District, with a population of 46,906 people consisting of 23,503 male residents and 23,403 female residents and an average population density of 530 people/km2. In the third position is the Karangrejo sub-district, with a population of 43,439 people consisting of 21,644 male residents and 21,795 female residents and a population density of 1,222 people/km2. Kauman District occupies the last position with a population of 31,396 people, consisting of 15,774 male residents and 15,622 female residents, and a population density of 356 people/km2. The population density between villages in all sub-districts is not evenly distributed. Geographical factors and unequal infrastructure contribute to this asymmetrical distribution.

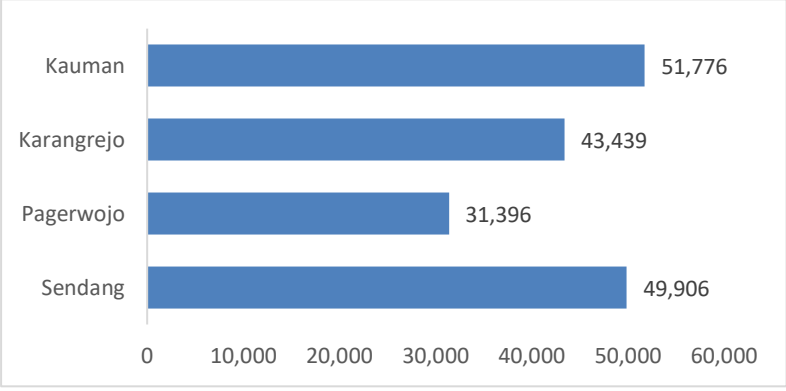

Figure 11. Total Population of KAS (BPS, 2021)

Furthermore, the population of the KAS is entirely dominated by the productive age group of 15-64 years. This shows that residents in the Districts of Sendang, Pagerwojo, Karangrejo, and Kauman have abundant human resource potential in developing the agropolitan concept. In addition, from the population composition above, it can be seen that the number of people with productive age is higher than the number of unproductive age. This demographic bonus for the government should be a distinct advantage because the high number of productive age population will help accelerate regional economic growth.

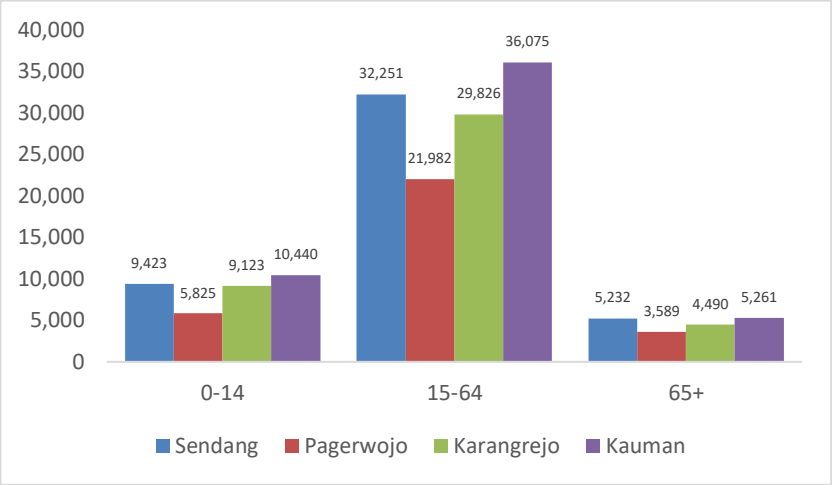

Figure 11. Total Population of Agropolitan Areas by Age Group (BPS, 2021)

If observed by age group, more than 50 percent of the population in Sendang District is in the productive age group, 32,251 people. The remaining 9,423 people are in the 0-14 year age group, and 5,232 people are in the age group above 65 years. Similar conditions were found in Pagerwojo District with a productive age group of 27,982 people, while the remaining 5,825 people were in the 0-14 year age group and 3,589 people in the over 65 year age group. Karangrejo subdistrict productive age group of 29,826 people, while the remaining 9,123 people in the age group 0-14 years and 4,490 people in the age group above 65 years. Furthermore, the productive age group in Kauman District is 36,075 people, while the remaining 10,440 people are in the 0-14 year age group and 5,261 people are in the age group above 65 years.

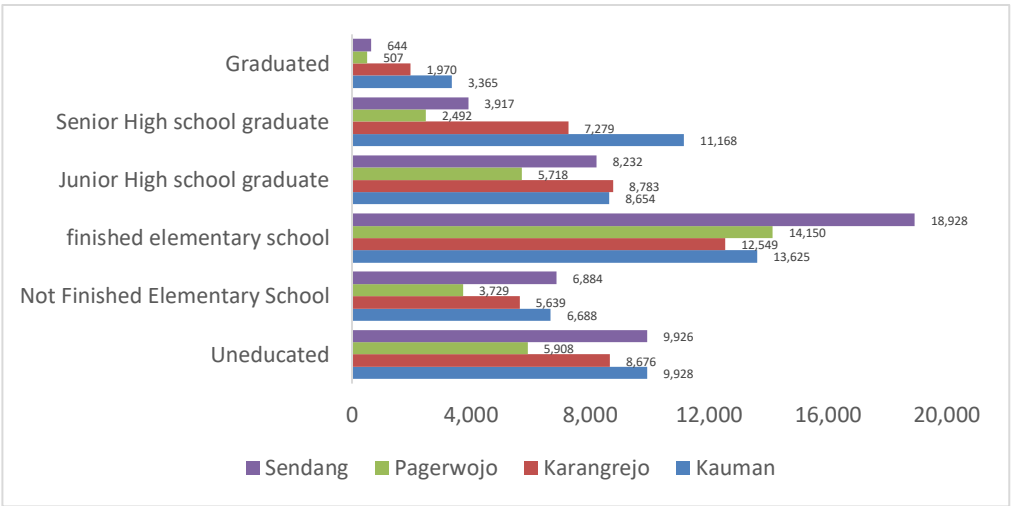

Figure 12. Total Population of KAS Based on Education (BPS, 2021)

The quality of human resources is also determined by how high the level of education is. In general, the availability of labor in agropolitan development is dominated by workers with a basic education level. Meanwhile, workers with junior high school and university education are more often found in the

Karangrejo and Kauman sub-districts. These districts are closer to the Tulungagung urban area, with more complete educational facilities. Therefore, in the future, it is still necessary to carry out training activities or increase skills so that agropolitan supporting sectors such as agriculture and animal husbandry can be maximized. The concept of agropolitan development should pay attention to increasing farmers and breeders' income and improving the welfare of rural communities. With the increase in the welfare of rural communities, it is automatically expected that the income of farmers and ranchers will also increase.

3.3. SWOT Analysis

Determination of alternative strategies for achieving each target indicator or set of inherent targets is first to conduct a SWOT (strength, weakness, opportunity, and threat) analysis. The main material used in the SWOT analysis is the result of the study of the strategic issues that have been formulated in the previous chapter, which are further classified based on the influence of internal and external factors attached to each issue. The identification of internal and external factors and the SWOT analysis are shown in the table below:

Table 1. Internal and External Factors

Strength	**Opportunity**
Managers of agropolitan areas have good communication skills with the community and related stakeholders	Availability of supporting infrastructure and agricultural processing that can support agropolitan areas
Decision making through the approval level according to the authority	Local residents have known and agreed with the government's commitment to developing agropolitan areas
There are farmer group institutions that support and accommodate farming communities around the agropolitan area	Local residents are involved in the development of agropolitan areas
Weakness	**Threat**
Resources owned by managers of agropolitan areas are low	Existing infrastructure does not meet the needs of agropolitan areas
The resources involved in the development of agropolitan tourism areas have not been trained and have not been professional	Infrastructure is in poor condition and poorly maintained
Management commitment to agropolitan areas is low	The government has not been able to fulfill the infrastructure needs of the agropolitan area
There has been no regular training to improve the skills and insight of agropolitan area managers. There is an overlapping in each agropolitan area manager position	The absence of adequate resources in managing the supporting infrastructure for agropolitan areas
There is no key performance indicator (KPI) in agropolitan area management	There is no environmental impact study on the development of agropolitan areas
	The government is less active in the dialogue with some residents who disagree with the existence of agropolitan
	The government has not formed and fostered a professional and adequate agropolitan area management team
	The policies taken related to the management of agropolitan areas have not absorbed the aspirations of the relevant stakeholders

From the identification of these internal and external factors, a strategy formulation is drawn up and divided into four types of strategy options:

a) S-O Strategy, a strategy that focuses on efforts to optimize strengths and maximize opportunities
b) S-T Strategy, a strategy used by using the strength (strength) owned to deal with the threats (threats) faced

c) W-O Strategy, the choice of strategy is made by improving the weaknesses (weaknesses) to maximize the existing opportunities (opportunities)
d) W-T Strategy, the choice of strategy with efforts to improve internal weaknesses to prevent the impact of threats (threats) that arise

The matrix of SWOT strategy choices in the development of KAS can be seen in the following table:

Table 2. The matrix of SWOT strategy choices

Internal Eksternal	**Opportunity**	**Threat**
	Availability of Supporting infrastructure and agricultural processing that can support agropolitan areas	The existing infrastructure does not meet the needs of agropolitan areas
	Local residents have known and agreed with the government's commitment to developing agropolitan areas	Infrastructure is in poor condition and poorly maintained
	Local residents are involved in the development of agropolitan areas	The government has not been able to fulfill the infrastructure needs of the agropolitan area
		The absence of adequate resources in managing the supporting infrastructure for agropolitan areas
		There is no environmental impact study on the development of agropolitan areas
		The Government is less active in the dialogue with some residents who disagree with the existence of agropolitan
		The Government has not formed and fostered a professional and adequate agropolitan area management team
		The policies taken related to the management of agropolitan areas have not absorbed the aspirations of the relevant stakeholders
Strength	**S-O Strategy**	**S-T Strategy**
Managers of agropolitan areas have good communication skills with the community and related stakeholders	Increase collaboration and synergy between cooperatives and business entities managing agropolitan areas with residents	Carry out development and improvement of infrastructure quality
Decision making through the approval level according to the authority	Increasing the empowerment of farmer groups in agropolitan areas	Conduct environmental impact studies to prevent natural disasters
There are farmer group institutions that support and accommodate farming communities around the agropolitan areas		Improve communication, dialogue, and collaboration between the government, cooperatives, area managers, and residents/farmer groups
		Carry out professional management of agropolitan area management
Weakness	**W-O Strategy**	**W-T Strategy**
Human resources owned by managers of agropolitan areas are low	Increase cooperation between managers and local residents in mutually beneficial schemes	Intensify regional support infrastructure development
Human resources involved in the development of agropolitan areas have not been trained and have not been professional	Conduct coaching and training for local residents as commodity producers	Increase awareness of agropolitan area managers to increase production in a sustainable manner
Management commitment of agropolitan areas is low		Improve management training and development, skill and knowledge of residents, farmer group, and cooperatives/agropolitan area manager
There has been no regular training to improve the skills and insight of agropolitan area managers		
There is overlapping in each position of the agropolitan area managers		
There is no key performance indicator in agropolitan area development		

Furthermore, to determine the strategy used in the development of the KAS, a SWOT analysis was carried out through a series of calculations known as IFAS (internal factor analysis strategy) and EFAS (external factor analysis strategy) calculations by calculating the weight value and ratings. Twenty people responded to the questionnaire from 30 distributed questionnaires.

Table 3. IFAS-EFAS matrix

	Weight	Rating	Score
Strength			
Managers of agropolitan areas have good communication skills with the community and related stakeholders	0,34	3,6	1,23
Decision making through the approval level according to the authority	0,32	3,5	1,12
There are farmer group institutions that support and accommodate farming communities around the agropolitan area	0,34	3,7	1,26
Total	**1,00**		**3,60**
Weakness			
Resources owned by managers of agropolitan areas are low	0,14	2,5	0,36
The resources involved in the development of agropolitan tourism areas have not been trained and have not been professional	0,17	2,8	0,48
Management commitment of agropolitan area is low	0,17	2,8	0,48
There has been no regular training to improve the skills and insight of agropolitan area managers	0,17	2,2	0,38
there is overlapping in each position of agropolitan area managers	0,17	2,5	0,42
There is no key performance indicator (KPI) in agropolitan area management	0,17	2,9	0,50
Total	1,00		2,62
TOTAL IFAS SCORE			**0,98**

Opportunity	Weight	Rating	Score
Availability of supporting infrastructure and agricultural processing that can support agropolitan areas	0,30	3,7	1,12
Local residents have known and agreed with the government's commitment to developing agropolitan areas	0,34	3,5	1,18
Local residents are involved in the development of agropolitan areas	0,36	3,6	1,29
Total	**1,00**		**3,60**
Threat			
Existing infrastructure does not meet the needs of agropolitan areas	0,12	2,5	0,30
Infrastructure is in poor condition and poorly maintained	0,11	2,8	0,32
The government has not been able to fulfill the infrastructure needs of the agropolitan area	0,12	2,6	0,31
The absence of adequate resources in managing the supporting infrastructure for agropolitan areas	0,11	2,5	0,29
There is no environmental impact study on the development of agropolitan areas	0,14	2,6	0,36
The government is less active in the dialogue with some residents who disagree with the existence of agropolitan	0,13	2,8	0,37
The government has not formed and fostered a professional and adequate agropolitan area management team	0,13	2,9	0,38
The policies taken related to the management of agropolitan areas have not absorbed the aspirations of the relevant stakeholders	0,13	2,6	0,34
Total	**1,00**		**2,67**
TOTAL EFAS SCORE			**0,93**

From the results of the IFAS-EFAS analysis above, it was found that the IFAS score was 0.98, and the EFAS score was 0.93. Thus, the right strategy used for the development of the KAS is the S-O strategy. In other words, two KAS development strategies can produce optimal impacts on regional development. The first is increasing collaboration and synergy between cooperatives and business entities managing agropolitan areas with residents. Triangular cooperation between farmers as producers, cooperatives as business managers, and business entities as users of agropolitan products must be carried out more intensively. The second is increasing the empowerment of farmer groups in agropolitan areas, which aims to improve the skills and knowledge of farmers in producing agricultural commodities in KAS. Further details can be seen in the following diagram:

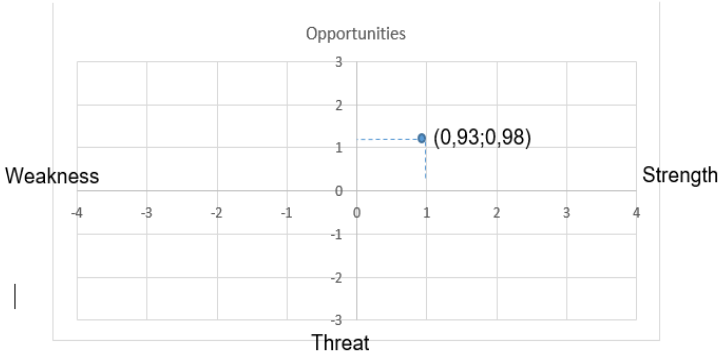

Figure 13. SWOT Diagram

After going through the analysis and compilation of data, the direction of the whole discussion returns to the main goal of whether or not agropolitan development can provide sustainable economic growth. Agropolitan development in the current state can provide sustainable economic growth. In summary, several factors that affect the ability of the Sendang Agropolitan Area (KAS) to become a sector that can be relied upon include policies, primary physical conditions (environment), and economic and social conditions of the population.

Even though it is not the main contributor to Tulungagung's GRDP at this time, the contribution of the agriculture, forestry, and fisheries sectors, including the Sendang Agropolitan Area (KAS) is still worthy of consideration. At the national, provincial, and district levels, the policy directions for developing the Sendang Agropolitan Area (KAS) show linkages and harmony. However, it is necessary to maintain consistency at the level of program or activity planning in regional apparatus and implementation at the community level of agropolitan actors. The relevant regional apparatus can promote cross-sectoral programs/activities by providing related infrastructures so that existing and future infrastructure can simultaneously spur agribusiness activities in the surrounding area.

The potential of the Tulungagung Regency Agropolitan Area should be viewed not only from economic growth but also from the potential environmental impact caused by the resulting development. Thus, land suitability and capability must be the main requirements in developing agropolitan areas to suppress potential disaster risks. Concerning the social aspect of the population, the composition of the population of the Sendang Agropolitan Region (KAS) shows that the productive age population is higher than the non-productive age. However, the laborers for agropolitan development are still dominated by workers with elementary school education.

The facts mentioned above can be developed into a regional development strategy in the next few years. The SWOT analysis provides several alternative strategy formulations, mainly increasing cooperation and synergy between cooperatives and business entities that manage agropolitan areas and residents, which are then developed into two main programs. The first is hinterland development areas that support the processing of agricultural products until it has added value. Second is the cooperation in providing infrastructures such as banking institutions, markets, and road networks. Furthermore, it is necessary to empower farmer groups through two programs: (a) skills training and quality improvement of innovative and creative agropolitan product standardization and (b) counseling on socio-economic fluctuations that impact people's lifestyles and behavior.

Conclusions

The development of the Agropolitan Area in Tulungagung Regency began in 2005 with the establishment of the Sendang Agropolitan Area (KAS). With various obstacles and challenges over the past 16 years, KAS still promises prosperity and sustainability if its development pays attention to several aspects. First, support for agropolitan development policies is obtained both from within the region and from regional, provincial, and central levels. Developing the necessary infrastructure, such as a road network, may accelerate development and increase economic growth in the Selingkar Wilis area. Second, the physical condition of the agropolitan area is at risk of flash floods, landslides, droughts, and forest

fires. Therefore, its development must also be guided by the spatial utilization plan. That is, the development of agropolitan must be in accordance with the structural plan, spatial patterns, and the carrying capacity of the environment so as to minimize the impact of decreasing environmental quality. Third, residents in the Districts of Sendang, Pagerwojo, Karangrejo, and Kauman have abundant human resource potential in developing the agropolitan concept. However, the availability of labor in agropolitan development is dominated by workers with a primary school education level. Thus, training and skill improvement are very much desired in the future.

From the SWOT analysis results, the proper strategy for the development of the KAS is the S-O strategy, (a) increasing collaboration and synergy between cooperatives and business entities managing agropolitan areas and residents, (b) increasing empowerment of farmer groups in agropolitan areas.

As with other studies, this study has some limitations. Since this is a case study, it cannot be generalized to a larger scope. Differences in research results are very likely to occur in different objects and research locations. Therefore, there is an opportunity to conduct further studies with the same theme but in different locations. Future research may focus more on business strategies and public and private sector partnerships.

Recommendation

The KAS in the Tulungagung regency can be likened to a sleeping giant. Since its establishment in 2005, the KAS has not been able to show itself as an ideal picture of an Agribusiness and Agro-industry area that drives regional economic growth, alleviates poverty, and triggers community welfare. This is apparent from the dominant production of raw goods compared to semi-finished and finished goods. KAS also faces the threat of land damage that can lead to natural disasters. Thus, we provide the following recommendations to develop KAS into an ideal agropolitan area.

First, develop areas that provide value-added facilities for agricultural products. Second, provide supporting infrastructures such as financial infrastructure, road networks, markets, and several other infrastructures through state financing, third parties, or public and private sector partnerships. Third, encourage innovation and creativity to improve the quality of Agropolitan products. Fourth, conduct counseling about the possibility of economic turmoil that affects people's behavior.

Implementation

KAS development is not a single sector development activity but is a cross-section development. The local governments can focus on providing infrastructures, connectivity, and developing human resources. Meanwhile, public and private sector partnership is carried out to encourage regional development in terms of capital, innovation, facilities, and marketing. Lastly, cooperation between local governments and the central government needs to be done to ensure support for policies that maintain agropolitan sustainability and regional integration.

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Commentary

Seasonal Waste Management in the Southern Coasts of Bali, Indonesia

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1. Introduction

The current waste problem in Indonesia has drawn serious attention from the local, national, and international communities. According to Jambeck et al. (2015), Indonesia produces 0.48 to 1.29 million metric tons of waste to the oceans every year. It makes the country become the second-largest marine debris contributor after China (Jambeck et al., 2015). Marine waste is defined as any manufactured or processed solid material produced by humans which is discarded or disposed of in the marine and coastal environment (Jeftic et al., 2009). The population growth and the changing lifestyle of modern Indonesian society have increased waste production, especially in urban areas (Prajati & Pesurnay, 2019). Floating marine debris is distributed and deposited along the coastlines due to the dynamic aspects of oceanography, i.e., currents, waves, and wind (Galgani et al., 2015; Tong et al., 2021). Seasonal changes influence the movement patterns and the speed of currents and wind, which will affect the volume of marine waste deposited in the coastal areas.

The high rainfall during the rainy or monsoon season (November-April) increases the amount of waste washed into waterways (sewers and rivers), increasing marine debris. During the rainy season, the currents and wind speed on the surface tend to be strong, washing the floating marine debris, especially plastic, ashore (Tong et al., 2021). The nature of plastic waste, which tends to be lightweight, buoyant, and easy to be carried away by currents, wind, and tides, contributes to this debris accumulating along the coastlines (Lavers & Bond, 2017). This has caused a growing volume of plastic waste on the coasts of Indonesia every year.

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This phenomenon of seasonal waste increase occurs in the coastal areas of Indonesia, including Bali (Maharta et al., 2021; Putra & Christiawan, 2019). For a few years, the seasonal waste accumulating on Bali's coastlines, especially on the beaches in the south, has garnered growing concerns from various communities, including local and international. It is because the beaches in south Bali are known as popular tourist destinations for domestic and international visitors. The beaches in south Bali frequently polluted by seasonal waste are the beaches in Kuta District, namely Seminyak, Legian, Kuta, Jerman, Kedonganan, and Kelan Beach (Putra & Christiawan, 2019). The most significant volume of seasonal waste on Bali's southern beaches is usually recorded during the monsoon season (November-April) (Husrin et al., 2017). According to the research by Putra and Christiawan (2019), from 2017 until 2018, the volume of seasonal waste deposited on the southern coasts of Bali ranged from 21 tons to 2,176.5 tons. This waste is in the form of plastic debris, organic materials, foams, household appliances, and so on (Husrin et al., 2017). The volume of seasonal waste is likely to increase along with the growing population and community needs if it is not handled appropriately from the source.

This paper will discuss the causes and sources of seasonal waste events that occurred on the southern coast of Bali. The land waste that leaks to the ocean is caused by the lack of waste management on the land (Jambeck et al., 2015). Proper and adequate waste management is essential when looking at the impacts caused by marine waste that littering the coasts. Especially for Bali Island, which relies heavily on the tourism sector, source-based waste management becomes urgent. To reduce the amount of ocean waste in Bali, it is crucial to know the extent of waste management that the Bali Provincial Government has implemented. This paper then further reviews the waste management that has been implemented through formal regulation and waste management facilities.

2. The causes and sources of the seasonal waste on Bali's southern coasts

Garbage originating from land-based activities is the primary source of waste polluting the ocean. Research showed that the waste from land accounts for 80% of the total composition of ocean waste. According to Jambeck et al. (2015) and Lebreton et al. (2017), the population growth and rapid economic activity in the urban areas, if not accompanied by adequate waste management infrastructure, are primary causes of waste leakage from land to the ocean. Another primary cause is the lack of knowledge and understanding in the community about the importance of managing waste locally, which could be done through sorting, recycling, and reducing the use of synthetic products such as plastic. In addition, insufficient public knowledge about the dangers posed by ocean waste to marine life and the coastal environment contributes to the lack of public awareness of these problems.

In the case of Bali's seasonal waste that piles up on the southern coasts of the island, most of the waste is predicted to come from the garbage floating in the Bali Strait, which occurs during the rainy season (Husrin et al., 2017; Yunanto et al., 2014). According to Husrin et al. (2017), the volume of deposited trash quadruples during the rainy season. So far, most studies report that marine debris in the Bali Strait is washed towards the coastlines in southern areas of Badung Regency, especially Kuta Beach (Maharta et al., 2021; Putra & Christiawan, 2019). Based on the analysis of the hydrodynamic model that simulated trash movement by Diastomo et al. (2021) and Maharta et al. (2021), marine waste piling up at Kuta Beach is dominated by the debris drifting from the rivers into the Bali Strait. From the results of the trajectory model, it is also known that during the rainy season, rivers that are closest to Kuta Beach can deposit up to 68% of the garbage, with the approximate time of just 1 – 2.5 days for the waste to reach Kuta Beach (Maharta et al., 2021).

Based on the analysis of the hydrodynamic model that simulated trash movement by Diastomo et al. (2021) and Maharta et al. (2021), marine waste piling up at Kuta Beach is dominated by the debris drifting from the rivers into the Bali Strait. From the results of the trajectory model, it is also known that during the rainy season, rivers that are closest to Kuta Beach can deposit up to 68% of the garbage, with the approximate time of just 1 – 2.5 days for the waste to reach Kuta Beach (Maharta et al., 2021). However, this floating debris in the Bali Strait can also potentially come from the mainland of the East Java region (Husrin et al., 2017). Husrin et al. (2017) explained that the distribution of waste in the Bali Strait depends on the current, wind speed, and moving pattern. The waste is carried away by the currents that move to the south with a speed of 0.5 – 1.75 m/s until it reaches Sembulung waters in East Java. Then, this waste spreads to the high sea and tends to be washed away to Bali's western and southern coasts. The garbage then combines with the marine debris coming from Bali's land and becomes the marine waste of Bali Strait. Eventually, this marine waste reaches Bali's beaches and accumulates along

the coastlines. By the end of 2015, a total of 6 – 10 tons of seasonal waste was cleaned up from Kuta Beach by the local Government every day (Husrin et al., 2017).

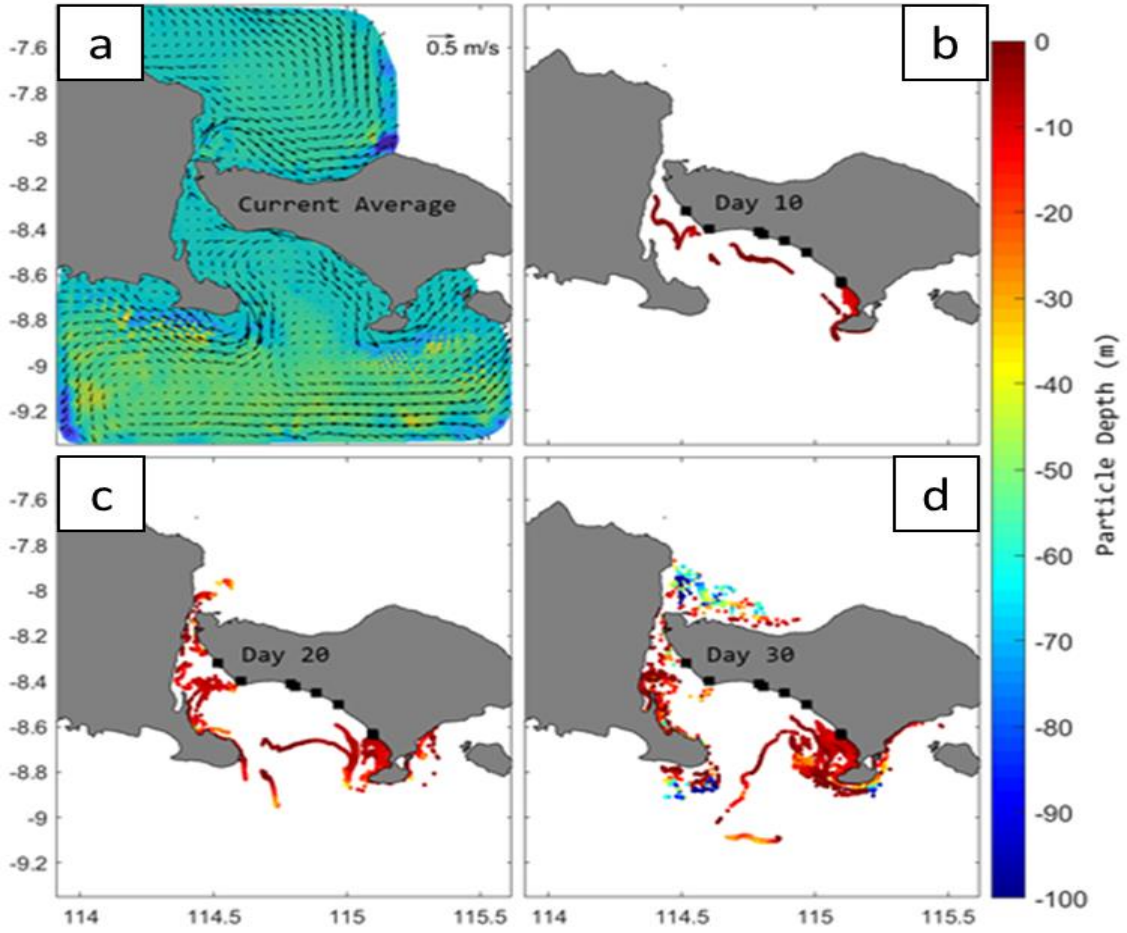

Figure 1. *The hydrodynamic model of particle movement from the river to Bali Strait simulated by Maharta et al. (2021). Black box: river source, (a) Current average, (b) Particle movements on day 10, (c) Particle movements on day 20, (d) Particle movements on day 30.*

3. Waste management in Bali

As regulated in Indonesian Government (2008) and the Minister of Public Works of Indonesia Regulation No. 03/PRT/M/2013, the waste management facilities generally comprise temporary disposal sites, 3R waste disposal sites, and final processing sites or landfills. These facilities are available in the coastal areas in Bali. The waste management flow in Bali still utilizes the old system, which is collecting, transporting, and disposing of the garbage. This same system is also implemented on Bali's southern coasts. Based on the data collected by Widyarsana et al. (2020) in 2018, the waste management facilities in south Bali (Denpasar City and Badung Regency) consist of 45 temporary disposal sites and 28 temporary disposal sites for 3R, and one final processing site known as Suwung Landfill. The data also shows that the highest garbage transporting service is in Denpasar City, reaching 83.5% compared to 40% in Badung Regency. This situation affected the waste management status between these two areas. Based on the latest data collection during the Bali Partnership program (Bali Partnership Platform, 2019), a total of 96% (1,360 tons/day) of produced waste in Denpasar City was already handled, with 94% being done at the temporary disposal sites and 2% was recycled. While, the amount of waste managed in the Badung Regency was only 73% (599 tons/day), with 67% done at the temporary disposal sites and 6% recycled. The volume of unmanaged waste was 286 tons every day combined between Denpasar (64 tons/day) and Badung Regency (222 tons/day). This unmanaged waste was either burned, discarded to the environment, or washed away in the water streams. This shows that the waste management operation in Bali is still really not optimal. Even though, the implementation of waste management in south Bali is relatively in

accordance with the laws and regulations set by the national and regional governments, yet the waste management from the source, especially in household level, is still very low.

Another main factor of mismanaged waste is low public awareness at the household level to manage their waste before being transportedo the waste management facilities (Hendra, 2016). The locals mindset remains that The final stage of waste management still relies on the landfill, which has a limited waste storage capacity, or littering in the environment, including in river. As a result, many of waste are leakage to the environment. In respond to the issue, the Governor of Bali issued another written regulation on source-based waste management under the Bali Government (2019) concerning Source-based Waste Management. The regulation highlights the obligation of managing waste from the very base level, such as from household level. However, the effectivity of the regulation is not assessed yet since it was released in 2019. The Government should conduct a regular evaluation on the implementation of the regulation. The evaluation will help to identify the changes in public awareness and behaviour. Therefore, a better strategy can be formulated to optimize the wastesource-based management

4. Strategies to reduce seasonal waste generation

Bali Government strongly supports better waste management to reduce the waste leakage from the waters to the environment. The Government has issued several laws related to the issue. Referring to Indonesian Government (2008) on Waste Management, the Bali Government issued a written regulation in the form of Bali Provincial Government (2011) concerning Waste Management. Due to the increasing amount of plastic waste compared to other types of waste in Bali, the Governor of Bali then issued a specific regulation to limit plastic waste generation, regulated in the Bali Provincial Government (2018). concerning the Limitation of Single-use Plastic Waste Generation. In 2019, the Governor of Bali issued another written regulation on source-based waste management under the Bali Government (2019) concerning Source-based Waste Management.

Although the waste management operation needs to improve, the main problem in waste management on the southern coasts of Bali lies in the lack of public awareness to manage the waste from its source, which is at the household level. Even though the written regulations have been established, the waste problem will keep on rising if there is no cooperation between the community and the Government. Therefore, the strategy formulated to deal with the waste problem should focus on the community level. In a quick study conducted by the World Bank about the condition of solid waste in Indonesia (World Bank, 2018), some strategies which can be taken to increase public awareness include:

- Collaborate with local Government, NGOs, residents, religious leaders, and local entrepreneurs to carry out campaign programs that support raising public awareness at the local scale.
- Collaborate with primary and secondary schools to increase the awareness on the importance of waste management from an early age for the younger generations. These activities to raise awareness for students can be included in the school curriculum so the students can practice them directly.
- Initiate voluntary clean-up movements on the coastlines led by the community to reduce the mounting trash at the beach.
- Implement strict sanctions on the community members for neglecting or violating waste management.

In addition to the above strategies, it is also essential to formally establish cooperation between the city and regency-level leaders since ocean waste does not come from one particular area only. Especially regarding the seasonal waste problem in south Bali, the local Government in the western region of Bali and the eastern region of Java should draw up a cooperation agreement on land waste management in their respective areas. This inter-regional agreement will enable the regional leaders to harmonize their land waste management programs. The followings are some programs that can be carried out in each region, namely:

- Educate domestic and international tourists about the seasonal waste problem occurring on the coasts
- Do regular beach and river clean-up activities by involving the local community
- Increase the number of waste management facilities, including recycling posts and waste banks

- Work with NGOs/communities that are concerned about river and ocean waste issues, such as Sungai Watch, Komunitas Peduli Sungai, and Trash Hero.

To developing strategies to increase the awareness of the local community, evaluating the policies that have been implemented is also very important. Monitoring and evaluating the policies, such as limiting the use of single-use plastic (Bali Provincial Government, 2018) and reducing waste generation from the source (Bali Government, 2019), can provide information and data on the effectiveness of the said policies. This will assist Bali's Government in determining the next steps in improving the waste management efforts on the island, including the coastal areas of Bali. In policy monitoring and evaluation, determining the evaluation method is crucial. Therefore, a collaboration with academics, researchers, and other relevant stakeholders is the key to success in monitoring and evaluating policies.

Conclusions

Most of the seasonal waste deposited along the coastlines in south Bali is predicted to come from the floating ocean waste in Bali Strait, which occurs during the rainy or monsoon season. Seasonal waste can negatively impact the local and regional economies in Bali. The Government of Bali has addressed the seasonal waste problem by issuing several new regulations to reduce single-use plastic waste and manage waste from the source to reduce the waste leakage in the environment. However, the waste management operation is still not optimal, leaving a considerable amount of unmanaged waste. Therefore, handling the waste from the source, whether at the household level or other economic activities (for example, industry and tourism), is crucial to reduce waste leakage into the environment and waste accumulation in landfills. The strategy formulation of waste management should focus on the community aspects, which includes raising public awareness through collaborative efforts between local Government, NGOs, and other local stakeholders targeting the local community and younger generation—also initiating voluntary clean-up campaigns and implementing strict sanctions on those who violate the regulation. Lastly, establishing a collaboration and agreement with other city and regency-level leaders in Bali and other regions, such as east Java, will significantly help cut the waste leakage to the environment, especially marine environments.

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Book Review

Indonesian Gastronomy (Volumes 1 and 2)

Yogyakarta: Global Pustaka Utama. 2019. 314 pp.
Yogyakarta: Global Pustaka Utama. 2019. 266 pp.

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Introduction

The books "Indonesian Gastronomy Volumes 1 and 2," written by Professor Murdijati-Gardjito and colleagues, are interesting because they are among the first gastronomic books authored by experts in Food Science and Technology. While representing a coherent work, the two volumes focus on different aspects. The first one explains aspects of Indonesian culinary history at the national and global levels, including the changes that have taken place in the contemporary era. The second volume pays attention to the technical aspects of physical changes and chemical reactions in the food-making process. Volume 2 also describes Indonesian cuisine based on geographical location and ethnic affiliation.

Body

Until recently, few works on Indonesian gastronomy existed. The publication of these two books, therefore, has provided detailed knowledge of how cuisine developed in Indonesia. More importantly, these two books widen the horizon of Indonesian culinary culture with its rich diversity and history.

The first volume consists of five chapters. Chapter 1 ("Introduction") defines Indonesian gastronomy. Chapter 2 ("Indigenous Knowledge to Global Related to Food Production and Consumption") discusses changes in food use and eating patterns from traditional to modern times. This chapter also explains the relationship between food and people's health and well-being. Chapter 3 ("Historical Aspects, Food Legends and Food Ingredients) recounts Indonesian culinary history. Chapter 4 ("Characteristics of Indonesian Gastronomy") describes the main features of Indonesian cuisine, including its contents,

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processing methods and functions. The last chapter ("The Main Foods of the Indonesian People") describes a variety of daily foods eaten by Indonesians. An interesting topic covered in this chapter is the development of rice's hegemony in Indonesian cuisine and the disappearance of local food varieties and their related customary knowledge.

The second volume deals with Indonesian culinary tastes and profiles and consists of eight chapters. Chapter 1 ("Introduction") provides a summary of the volume's chapters. Chapter 2 ("Physiological Aspects and Taste Stimulation of Enjoying Food") discusses the characteristics of taste in Indonesian cuisines; it also describes the factors that influence the appearance of taste. Chapter 3 ("Spices and Other Ingredients with Typical Indonesian Flavours") discusses spices, seasonings and complements used in local cuisines. Chapter 4 ("Physical Aspects of Cooking Food") examines the physical changes that take place during various cooking processes, while Chapter 5 ("Molecular Gastronomy") describes the chemical reactions. Chapter 6 ("Physicochemical Aspects of Gastronomy") provides knowledge about chemical reactions and physical changes in cooking food. Chapter 7 ("A Portrait of Indonesian Cuisine: The Art of a Thousand Ethnic Kitchens") describes the diversity of Indonesian cuisine in terms of main dishes, side dishes, snacks and beverages. Finally, Chapter 8 ("Indonesian Cuisine and Global Community Tastes") discusses the advantages of Indonesian cuisine in terms of health, global popularity, functional value and traditions.

Through the two volumes, the authors wanted to contribute to the issue of food security. The second volume, for example, highlights the importance of food diversification and biodiversity protection. The books also show the significance of preserving local wisdom concerning Indonesian food. Food security can be achieved by returning to traditional farming systems and gradually eating more traditional diets. This book also shows how diverse Indonesian food is from Aceh to Kalimantan (see pages 35–82) to Papua (page 198). The second volume highlights the variety of spices used locally. Spices consist of seasonings and herbs. Furthermore, considerable space is dedicated to discussing the diversity of main courses, side dishes, desserts and beverages. The authors reveal the variety and richness of Indonesia's kitchen culture, which represents a unique pearl of local wisdom. More than that, this book reminds us again that Indonesia has an alternative to the domination of rice. By appreciating and using existing cultural heritage, the solutions for sustainable food security can get closer.

One of the book's shortcomings is the long explanation of agrobiodiversity. Moreover, the discussion of certain foods is neither well explained nor proportionate, including coconut, tempeh and complementary main dishes (five triads of people: vegetable [Lalap], sambal sauce, soy sauce [Kecap], crackers [Kerupuk] and salted fish [Ikan Asin], as well as curd [Dadih], fermented cassava [Tape] and fermented white and black glutinous rice [Brem]). For example, the discussion of coconut milk is excessively long (37 pages), while the investigation of crackers and salted fish is very short.

From the perspective of gastrodiplomacy, gastronomy, as explained in the books, has significant implications for how the diversity of Indonesian cuisine shapes the nation's identity and its branding. As an aspect of national identity, cuisine can be a distinguishing feature among countries. Moreover, as a brand, culinary culture can shape the perception of a nation in the minds of the international public (Fischler, 1988; Kimura, 2016; Polese et al., 2020; Reddy & van Dam, 2020). The two books argue that Indonesia's appetisers, main menus, side dishes and snacks show the identity and brand of an agrarian country. However, the books do not describe Indonesia as a maritime country even though it has thousands of islands and the second-longest coastline in the world.

Conclusions

Overall, the books provide a good overview of the culinary richness and local wisdom of Indonesian kitchen culture. The books also offer alternative local solutions to problems stemming from globalisation, such as sustainable food and food security. Therefore, this work will undoubtedly become an essential reference for sustainable Indonesian gastronomy. However, if the goal is to project Indonesian gastronomy as a brand linked to a maritime nation, it should be noted that this work reinforces the identity of an agrarian country.

The Example Cover book

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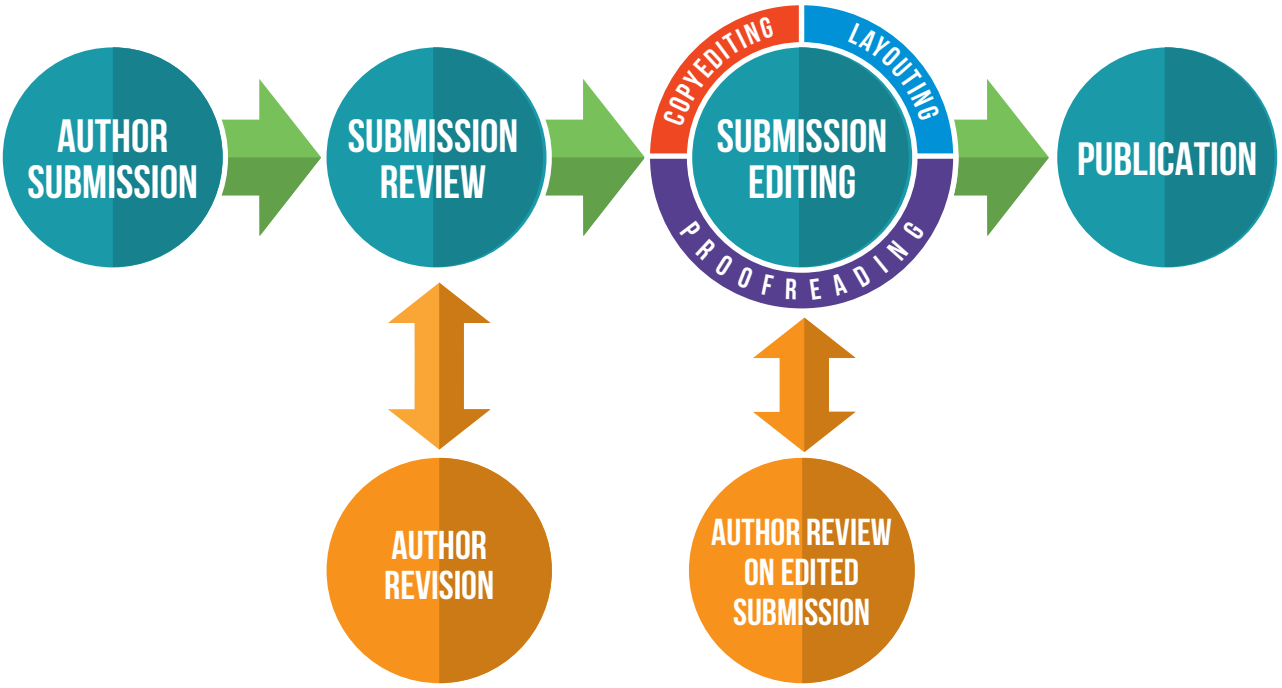

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