JISDeP
The Journal of Indonesia Sustainable Development Planning

Vol. 3 No. 2
August 2022

The Journal of Indonesia Sustainable Development Planning

E-ISSN: 2722-0842
P-ISSN: 2721-8309

journal.pusbindiklatren.bappenas.go.id

Kementerian PPN/ Bappenas

Supported by:

PERKUMPULAN PERENCANA PEMBANGUNAN INDONESIA
PPPI

Kementerian PPN/ Bappenas

JISDeP
The Journal of Indonesia Sustainable Development Planning

The Journal of Indonesia Sustainable Development Planning

VOL. 3 NO. 2 - AUGUST 2022

Supported by

PERKUMPULAN PERENCANA PEMBANGUNAN INDONESIA
PPPI

Cover

Design : Hafidh Aditama
Photo : freepik.com

The Journal of Indonesia Sustainable Development Planning

VOL. 3 NO. 2 - AUGUST 2022

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING (JISDeP)

Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren), Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address : Jalan Proklamasi 70, Central Jakarta, Indonesia 10320
Phone : +62 21 31928280/31928285/31928279
Fax : +62 21 31928281
E-mail : journal.pusbindiklatren@bappenas.go.id

Available online at

journal.pusbindiklatren.bappenas.go.id

E-ISSN: 2722-0842 (online)
P-ISSN: 2721-8309 (print)

Supported by
Indonesian Development Planners Association (PPPI)

Indexed by

Editorial Team

The Journal of Indonesia Sustainable Development Planning

Peer Reviewers

JISDeP The Journal of Indonesia Sustainable Development Planning

NAME	EXPERTISE	INSTITUTIONS
Vid Adrison	Public Finance, Applied Econometrics, Industrial Economics, Environmental Economics	University of Indonesia
Tatang Muttaqin	Sociology and Education	Ministry of National Development Planning/Bappenas
Arie Damayanti	Development Economics, Labor Economics, Applied Econometrics	University of Indonesia
Ridwan Sutriadi	Computer Science, Social sciences, Decision Sciences, Earth and Planetary Sciences, Busines, Management and Accounting, Environmental Science, Engineering, Materials Science, Urban Planning, Land Use, Communicative City, Smart City, Urban Governance	Bandung Institute of Technology, Indonesia
Agus Pramusinto	Social Sciences	Gadjah Mada University, Indonesia
Andy Fefta Wijaya	Engineering, Chemistry, Social Sciences, Agricultural and Biological Sciences, Medicine, Materials Science, Nursing, Economics, Econometrics and Finance, Psychology, Public Administration	University of Brawijaya, Indonesia
Devanto Shasta Pratomo	Labour Economics	University of Brawijaya, Indonesia
Budiono	International Economics, Environmental Economics	Padjadjaran University, Indoenesia
Agus Trihartono	Southeast Asian Studies, Regionalism, International Relations, Soft Power	University of Jember, Indonesia
Novri Susan	Sociology	University Airlangga Indonesia
Ibnu Syabri	Transportation Planning, GIScience, Regional Economics	Bandung Institute of Technology, Indonesia
Yusuke Toyoda	Biology, Earth and Planetary Science, Social Sciences, Environmental Science.	Ritsumeiken University, Japan
Eny Faridah	Forest Science/ Trees Physiology And Forest Land/ Silviculture	Gadjah Mada University, Indonesia
Syarifah Liza Munira	Research Fellow, Health Economics	Australian National University, Australia
Ronald L. Holzhacker	Social Sciences, Economics, Econometrics and Finance, Busines, Management and Accounting, Arts and Humanities	Groningen University, Netherland
I-Soon Raungratanaamporn	Decision Sciences, Engineering, Business, Management and Accounting	Suranaree University of Technology, Thailand
Aria Kusuma	Public Health & Environment Health	National Institute of Health Research Development
Arief Anshory Yusuf	Economic Development, Poverty, Inequality	Padjadjaran University, Indonesia
Mitsuhiko Kataoka	Development Economics, Regional Economics	Rikkyo University, Japan
Mohammad Zulfan Tadjoeddin	Economics of conflict, Employment, Indonesia and Southeast Asian Studies	Western Sydney University, Australia
Aries Purwanto	Environment, Land & Water, Development Planning, GIS Analysis	HE-Delft & Wageningen University & Research (WUR), Netherland

Peer Reviewers

JISDeP The Journal of Indonesia Sustainable Development Planning

NAME	EXPERTISE	INSTITUTIONS
Ana Noveria	Finance, Industrial Economics, Labor Economics, Behavioral Economics, Health Economics	Bandung Institute of Technology, Indonesia
Ratna Lindawati Lubis	Education, Entrepreneurship, Ecopreneurship, Strategic Management	Telkom University, Indonesia
Ismail Suardi Wekke	Education, Islamic Education, Arabic Language Education, Islamic Studies, Religious Studies	State Islamic Institute (IAIN) Sorong, Indonesia
Seno Adi Putra	Multiagent System, Machine Laerning, Wireless Sensor Network, Service Oriented Architecture Java Technology	Telkom University, Indonesia
Kamaruzzaman Bustamam-Ahmad	Sociology, Anthropology, Islamic Studies, Southeast Asian Studies	State Islamic University (UIN) Ar-Raniry, Banda Aceh, Indonesia
Yudi Aziz	Innovation Management, Operation Management, Operation Research, Decision Science	Padjadjaran University, Indonesia
Diah Widyawati	Environmental Economics, Industry, and Development Econ	University of indonesia, Indonesia
Muhammad Halley Yudhistira	Urban economics, Transportation economics, Applied econometrics	University of indonesia, Indonesia
Iwan Nugroho	Regional Development, Ecotourism, Socio Economic, Economics	Widyagama University of Malang, Indonesia
Ninik Suhartini	Informal Urbanism, Urban governance, Inclusive City	Bandung Institute of Technology, Indonesia
Wiwandari Handayani	Research Group in Regional Development and Environmental Management Department of Urban and Regional Planning	Diponegoro University, Indonesia
Rukuh Setiadi	Urban Environmental Planning Governance, Climate Change Adaptation for Cities, Policy Development Process, Urban Resilience	Diponegoro University, Indonesia
Sri Rum Giyarsih	Urban Studies and Environmental Geography	Gadjah Mada University, Indonesia
Ronggo Sadono	Forest Biometrics and Modeling	Faculty of Forestry, Gadjah Mada University, Indonesia
Shawkat Alam	Public International Law, International environmental law, Sustainable Development, WTO and Sustainable Development, Governance and Public Policy	Macquarie University, Australia
Prihadi Nugroho	Regional Planning, Regional Development, Urbanization, Industrialization, Rural-Urban Linkages	Diponegoro University, Indonesia
Fadjar Hari Mardiansjah	Regional Urbanization, Extended Urbanization, Sustainable Urbanization, Small Towns Development, Rural-Urban Linkages	Diponegoro University, Indonesia
Landung Esariti	Housing, Gender Studies, Property Studies	Diponegoro University, Indonesia
Budi Harsanto	Sustainability Innovation, Operations and Supply chain management	Padjadjaran University Indonesia,
Rahayu Yoseph-Paulus	Climate Change Adaptation, Disaster Risk Reduction, Urban Planning	Dayanu Ikhsanudin University, Buton Regency, Indonesia
Thia Jasmina	Economics of education, decentralization, government spending	University Indonesia, Indonesia

Peer Reviewers

The Journal of Indonesia Sustainable Development Planning

NAME	EXPERTISE	INSTITUTIONS
Tibertius Agus Prayitno	Forestry, Wood Adhesion, Biomaterial Engineering, Quality Control Processing	Gadjah Mada University, Indonesia
Taishi Yazawa	Enviromental Science,Social Sciences,Engineering, Education for sustainable development	Ritsumeikan University, Japan
Azis Musthofa	Geography	Gadjah Mada University, Indonesia
Faza Fawzan Bastarianto	Transport Policy	Gadjah Mada University, Indonesia
Wan Abd Al-Qadr Imad Bin Wan Mohtar	Biology	Institute of Biological Sciences, Malaysia
Adi Ainurzaman Bin Jamaludin	Biology	Institute of Biological Sciences, Malaysia
Erwin Ardli	Trophic Modeling Mangrove Coastal Ecology	Jenderal Soedirman University
Dewi Khairani	Software Measurements Project Management	UIN Syarif Hidayatullah

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

JISDeP The Journal of Indonesia Sustainable Development Planning

Vol. 3 No. 2 - August 2022
E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Kementerian PPN/ Bappenas

Contents

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 2 - AUGUST 2022

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Editorial Note

The Progress of the SDGs Research

Wignyo Adiyoso

EDITOR IN CHIEF

The global Sustainable Development Goals (SDGs) provide an evidence-based policy for sustainable development planning and programming to halt poverty, gain prosperity and protect the planet by 2030 (Parmentola et al., 2022). The SDGs consist of 17 goals and 169 targets that emphasize the balance between economic, social and environmental sustainability. Since the framework launched in 2015, there have been growing international policies, practices, innovations, assessments and research activities related to such issues (Caballero, 2019).

As a part of policies and a policy itself, it is important to see the progress of the SDG from the research perspective. The importance of evidence-based policy--research utilization in policy-- is increasingly recognized (Tseng, 2012). Recent reports calling for more efforts to improve the quality of policies attract attention to desired outcomes (Hanney et al., 2003). The research provides better information and more prudence in the policy process. As stated by Fayomi et al., (2018), policymakers and practitioners use research for many reasons, including instrumental, conceptual, and political, which is applied in the context of the implementation of the SDGs. This editorial note presents a piece of initial information concerning research activities on SDGs for understanding the uses of research in SDGs policy and practices.

A wide range of research institutions supports the SDGs to ensure that knowledge is documented and spread. One leading body to provide an information research platform is the RELX SDG Resource Centre (RELX SDGS Resources Centre, 2022). The centre is a global strategic alignment supported by Elsevier—one of the biggest Journal publishers. The public can access articles, reports, tools and activities

ARTICLE INFO

Received: August 30, 2022
Received in revised form: August 30, 2022
Accepted: August 30, 2022
doi: 10.46456/jisdep.v3i2.337

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail:
journal.pusbindiklatren@bappenas.go.id

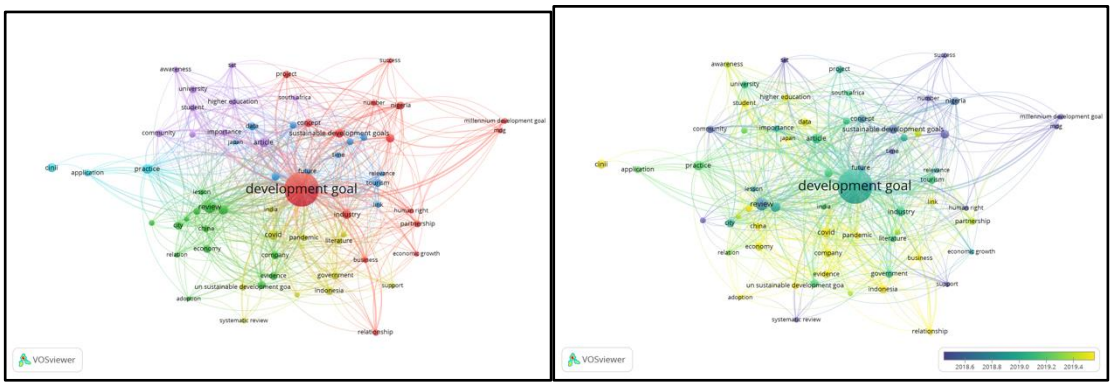
Supported by Indonesian Development Planners Association (PPPI)

related to the SDGs based on topic category and region. Another supporter of SDGs research is the university. With its capabilities dan function, the university provides support to enhance knowledge, skill, and research to achieve SDGs. As more universities turn their attention to the SDGs, many study centers emerge to dedicate research to achieving the SDGs (Bhowmik et al., 2017).

The JISDEP analyses the research on SDGs using bibliometric tools to reveal the progress of the SDGs from the research published. Data has been harvested by using Publish or Perish from "google scholar (GS)" and "Scopus" databases. Bibliographic database were processed and analyzed using VOSviewer. Keywords "SDGs AND (research OR study)" were searched from both GS and Scopus databases with the parameters of the journals published between 2015 and 2021. The GS searching resulted in 1000 (maximum allowed), and Scopus was 200 (maximum allowed). Parameters were set in VOSviewer, such as field to be extracted, "Tittle and abstract field", binary counting method, the minimum number of occurrences in a term (10), and the number of terms (70). A small number of terms were excluded, including "example" and "exact". The result of the VOSwiewer analyzed was 68 items, 6 clusters, 690 links, and total strength is about 1457.

The main theme of research on SDGs, from the most to least popular, is described in Figure 1a. The development goal is the most discussed since this term is related to SDGs. Other issues discussed in the research are review, industry, company, evidence, data, practice and economy. Other keywords in the discussion of the SDGs research are article, application, partnership, concept, Nigeria, universities, South Africa and others. The result of this study shows the topic discussed has not yet covered the 17 SDGs goals. There is no keyword such as poverty, health, gender, clean water, energy, climate change, and peace and justice.

In the context of the research phase, Figure 1b explains that current research on the SDGs issues focused on China, covid, evidence, company, economy, data, students, relationships and Indonesia. It is worth mentioning that although the SDGs started in 2015, research activities were only initiated in 2018. Other issues such as city, tourism, industry, concept, article, Nigeria, MDG and support became the attention in 2018 and 2019. This implies that there are shifting goal issues and countries related to SDGs research.



a b

Figure 1: Visualization of Themes and Period of the Research on SDGs

This initial study using bibliometric data from GS and Scopus database shows that not all 17 issues targeted in the SDGs appeared in the research activities from 2015 to 2021. Issues such as industry, company, evidence, data, practice and economy are most commonly used in SDGs research. The topics of SDGs and countries involved in the research activities are also changing since the beginning of SDGs implementation. This initial study implies that more research covering all 17 goals and 169 targets should be mapped to ensure that all issues are considered equally important. Future research should cover the

quality and applicability of the SDGs implementation. Continued assessments and evaluations are essential to achieve the SDGs in 2030—only seven years left.

References

Bhowmik, J., Selim, S. A., & Huq, S. (2017). The role of universities in achieving SDGs. *CSD-ULAB and ICCCCAD Policy Brief*. ULAB.

Caballero, P. (2019). The SDGs: Changing how development is understood. *Global Policy*, *10*, 138–140. https://doi.org/10.1111/1758-5899.12629

Fayomi, O. S. I., Okokpujie, I. P., & Udo, M. (2018). The role of research in attaining sustainable development goals. *IOP Conference Series: Materials Science and Engineering*, *413*(1). https://doi.org/10.1088/1757-899X/413/1/012002

Hanney, S. R., Gonzalez-Block, M. A., Buxton, M. J., & Kogan, M. (2003). The utilisation of health research in policy-making: Concepts, examples and methods of assessment. *Health Research Policy and Systems*, Article 2(2003) https://doi.org/10.1186/1478-4505-1-2

Parmentola, A., Petrillo, A., Tutore, I., & de Felice, F. (2022). Is blockchain able to enhance environmental sustainability? A systematic review and research agenda from the perspective of Sustainable Development Goals (SDGs). *Business Strategy and the Environment*, *31*(1), 194–217. https://doi.org/10.1002/bse.2882

RELX SDGS Resources Centre. (2022). *RELX Sustainable Development Goals (SDGs) Resource Centre*. https://sdgresources.relx.com/about

Tseng, V. (2012). The uses of research in policy and practice. *Social Policy Report*, *26*(2). www.srcd.org/spr.html

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 2 - AUGUST 2022

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Research Paper

Gender Wage Gap: Evidence from Employment in Informal Sector

Fakhriza Akbar

Statistics of Indonesia, Jakarta, Indonesia

fakhriza@bps.go.id

ABSTRACT

The gender wage gap is still a common phenomenon in many developing countries, especially in the informal sector. As opposed to the formal sector, the gender wage gap seems more adverse in the informal sector, where women are often in unfavourable situations to lessen the substantial wage gap between them and men. This study examined the gender earnings gap from the lower level to the upper level of the wage distribution in informal sector employment using the Indonesian National Labor Survey in 2019. While the Oaxaca-Blinder method only looked at the wage gap from the differences in mean values, this research used the Recentered Influence Function (RIF) to reveal the gaps in the wage distribution. The research found the presence of a weak sticky floor effect across the wage distribution. The gender earnings gap decreased as we moved from the lower wage distribution to the upper wage distribution. Furthermore, the structure effect or unexplained factors contributed to the most prominent share of the gap that forms the wage difference for the entirety of the wage distribution, ranging from 70 per cent. Having examined the individual characteristics, education was found to be the most prominent factor that can help narrow the gap.

Keywords: Gender; Wage Gap; Informal; Labour

ARTICLE INFO

Received: June 8, 2022
Received in revised form: August 8, 2022
Accepted: December 30, 2022
doi: 10.46456/jisdep.v3i2.301

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/3192828285
Fax: +62 21 31928281
E-mail:
journal.pusbindiklatren@bappenas.go.id

Supported by Indonesian Development Planners Association (PPPI)

1. Introduction

One of the most prominent issues in the labour market is the gender wage gap, which refers to the difference between women's wages and men's wages at an equal level of productivity (Blau and Khan, 2000). The fact that women and men are paid unequally has become a global phenomenon. Each country may have different gender earnings gaps depending on the levels of income. Among the high-income countries, the Netherlands has the largest gender wage difference, with women earning around 40 per cent lower than men, followed by the Republic of Korea at about 37 per cent wage gap. The average gender wage gap is below 20 per cent worldwide for upper-middle-income and lower-middle-income groups. Meanwhile, the group of lower-income countries has the highest average gap compared to the other income groups, with about 28 per cent of women (International Labour Organization, 2018).

In Indonesia, the gender pay gap still exists where women generally earn lower salaries than men, conditional on socio-economic characteristics. Pirmana (2006) discovered that women make 23 per cent less than men, in which 42 per cent of the difference resulted from the differences in individual characteristics such as education and experience, while 58 per cent was due to discrimination. Taniguchi and Tuwo (2014) claimed that a significant gender wage gap might be caused by several factors, such as types of occupation, industry categories, work hours, age, and educational levels. Thus, female workers' wages are constantly and extensively inferior to those of male workers because of non-market factors.

Studies focusing on this issue within the Indonesian context are still limited due to the sole focus on the wage gap in general (Hennigusnia, 2014; Mardiana, 2015; Pirmana, 2006). However, none of the studies explored more specific sectors, such as the informal sector. It is important to portray the wage gap in the informal sector as workers often experience unfavourable situations compared to those in the formal sector (Pooittiwong, 2017). This situation is a result of informal labour market characteristics such as lack of social protection, work hours, regulations, and minimum wage policy. Consequently, the wage gap in the informal sector becomes increasingly wide. In Indonesia, women who work in the informal sector accounted for 61,37 per cent in 2017 compared to men at 54,34 per cent (Badan Pusat Statistik Indonesia [BPS], 2018). Women in informal employment mostly have two-fold negative consequences: first, informal employees earn less than formal employees, and women are paid less than men. Women are over-represented in the lower part of the informal work-related segment. Thus, this fact proves that the gender wage gap may also be greater in the informal sector than in the formal sector (Organization for Economic Cooperation and Development [OECD], 2020).

There are two types of trends in the gender wage gap, which are called the glass ceiling effect and the sticky floor effect. The glass ceiling effect, which portrays a larger gap in the upper wage distribution, commonly occurs in many advanced countries (Albrecht et al., 2003; Arulampalam et al., 2007; De la Rica et al., 2005). Meanwhile, a larger wage gap in lower income distribution referred to as the sticky floor effect, is generally found in some developing countries. In China, the wage structure effect is the prominent reason behind the increase in the gap in total gender incomes rather than the differences in gender characteristics (Wei and Li, 2007). Similarly, Fang and Sekellariou (2011) also stated the presence of a robust sticky floor effect in the Thailand labour market depicted women's difficulty in maintaining similar wages to men at the lower distribution. The unexplained factors still become the reasons behind the gender wage gap, and the differences in characteristics can elucidate only a small part of the gender wage gap. This situation implies that women tend to occupy less favourable positions at a lower wage distribution than men. The wage distribution can portray the labour market segmentation, in which informal employment mostly dominates the bottom-end distribution. This situation leads to the sticky floor effect (Tannuri-pianto & Pianto, 2004; Ruzik & Rokicka, 2012).

Among individual endowments, human capital in education plays a major role in reducing the gender wage gap. Kassenboehmer and Sinning (2014) found that women with higher educational levels may have a better chance of narrowing the bottom wage distribution gap. Similarly, Blau and Kahn (2007) stated that human capital, such as educational attainment, can help women reduce the wage differences at the bottom and middle-wage distribution. Education also plays a role in the Korean labour market; Sun and Kim (2017) revealed that women's return to education is higher at the upper wage distribution than at the lower wage distribution.

This study attempted to fill this gap in the existing body of research and analysed the determining factors behind the gender wage gap in the informal sector in Indonesia. This research had policy implications for gender inequality in the Indonesian labour market, especially in the informal sector.

2. Methodology

Most research related to the gender wage gap focused on the mean differences generated through the Oaxaca-Blinder Decomposition method, proposed by Oaxaca (1973) and Blinder (1973). However, Firpo et al. (2018) extended the Oaxaca-Blinder wage decomposition with an additional method called Recentered Influence Functions (RIF). The method comprises two stages; Firstly, the wage distribution is separated into two factors called the composition effect and structure effect with the counterfactual distribution for the two-fold decomposition. Second, the structure and composition effects are applied to each variable, basically similar to the method of Oaxaca-Blinder. The critical difference between the current study and the study of Oaxaca-blinder is the use of the method developed by Firpo et al. (2009) and Fortin et al. (2011) in the current study, in which the dependent variable of the regression is substituted by a suitable RIF. This method allows us to decompose the wage differential at any percentiles by using the standard Blinder-Oaxaca decomposition.

The RIF unconditional percentiles regressions apply estimation for men, women, and counterfactual earnings distributions:

$$\widehat{RIF}(Y_k; \hat{q}_\tau) = X_k \hat{\beta}_k, \qquad \text{k=m,f,c} \qquad (1)$$

Where $\widehat{RIF}(Y_k; \hat{q}_\tau)$ represents RIF estimate for the τ th percentiles and $\hat{\beta}$ represents the estimate of unconditional percentiles partial effect. Meanwhile, the subscripts *m, f, and c represent men, women, and counterfactuals*. Thus, decomposition can be derived as follows:

$$\hat{q}_\tau(Y_m) - \hat{q}_\tau(Y_f) = \{\underline{X}_f(\hat{\beta}_c - \hat{\beta}_f) + \hat{R}_\tau^s\} + \{(\underline{X}_m\hat{\beta}_m - \underline{X}_f\hat{\beta}_c) + \hat{R}_\tau^c\} \qquad (2)$$

Where $\hat{q}_\tau(Y_m) - \hat{q}_\tau(Y_f)$ denotes the raw gender wage gap at the τ th percentiles and $\underline{X}$ detonates the vector of covariates averages. Since $\hat{\beta}_c$ is from the counterfactual distribution, which assumes men return to labour characteristics for women, $(\hat{\beta}_c - \hat{\beta}_f)$ measures the men-women differences in return to labour market characteristics. Thus, $\underline{X}_f(\hat{\beta}_c - \hat{\beta}_f)$ represents the structure effect, i.e., the gender wage gap at the τ th percentiles due to different returns. Meanwhile, $(\underline{X}_m\hat{\beta}_m - \underline{X}_f\hat{\beta}_c)$ represents the composition effect, i.e., the gender wage gap at the τ th percentiles due to the endowment differentials. $\hat{R}_\tau^s$ and $\hat{R}_\tau^c$ are the estimate of the approximation error corresponding to the structure effect and composition effect.

This study applied cross-section data from the National Labor Force Survey (Sakernas) in 2019. The survey is conducted twice a year, in February and in August. The two surveys are different in terms of estimation levels in which the February Sakernas gas a province-level analysis (50.000 households) while the August Sakernas has regency-level estimation (200.000 households). This research applied a sample from August Sakernas because it had a higher level of analysis. The household survey contains detailed information related to labour, such as wage, education, type of occupation in the household, age of workers, monthly income, and other variables. This study only focused on employees and casual workers (consisting of 114,021 individuals) aged 15—65 years in the informal sector. For variables, the wage is defined as money and goods earned by the workers in the previous month.

As this paper focused on the informal sector, we derived the concept of informality from the International Conference of Labor Statisticians (ICLS). BPS recently adopted the latest ICLS-17 concept related to informality by incorporating more informality-targeted questions in labour survey questionnaires. In this study, we chose specific questions related to access to social security and job contract to determine employment in the informal sector:

1. Does the company/business/workplace provide health insurance/ work injury insurance/ protection from work-related death?
2. Does the company/business/workplace provide annual leave/sickness/maternity without cutting wage/salary?
3. Do you have an agreement/employment contract/decision letter?

Table 1: List of Variables

Variable	Type	Notation	Note
Natural Log of Wage	Dependent Variable	Lnwage	Wage per hours
Experience	Independent Variable	exper	Experience from the primary job (negative values set to zero)
Training	Independent Variable	train	Dummy var: 0: no training experience (reference) 1: have training experience
Area of living	Independent Variable	area	Dummy var: 0: rural (reference) 1: urban
Marital Status	Independent Variable	marital	Dummy var: 0: not married (reference) 1: married
Head of Household	Independent Variable	headhh	Dummy var: 0: not head of household (reference) 1: head of household
Education	Independent Variable	Primeduc, highsch, college	Dummy var: primeeduc&below (references) 1: highsch 1: college
Type of sectors	Independent Variable	Agriculture manufacture mining trade transport business services other services	Dummy var: agriculture (references) 1: manufacture 1: mining, energy, and construction 1: trade 1: transport, storage, and communication 1: business services 1: other services

3. Results and Discussions

The finding showed some differences in the mean values of the independent variable. For income, male workers have 70 % higher income than women in the informal sector. In terms of age, the ages of men and women are not significantly different, with men being 37 years old on average and women being 38 years old in general. In regards to work hours, males work longer (184 work hours per month) than women (163 hours per month). Table 2 shows that men had more experience in informal sector employment (7.2 years of experience) compared to women (5.9 years of experience).

Table 2: Summary Statistics

Variables	Men		Women	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Income (Rp per month)	1,895,681	1,185,766	1,113,032	901,145
Workhour (per month)	184.6	57.1	163.4	68.9
Lnwage	9.1	0.6	8.7	0.7
Education (in years)	7.6	4.1	7.6	4.6
Variable	**Men**		**Women**	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Age	37.8	12.3	38.5	12.7
Experience	7.2	8.5	5.9	7.9

Source: Author's calculation

Table 3 shows the average wage per hour for both genders, where men's hourly wage is higher than women's hourly wage at all group levels. Viewed from the educational attainment variable, overall, men earned higher per hour compared to their female worker counterparts. Women with a higher education level have more advantages than women at the primary or college level. Women's average wage over men is 67 per cent to 70 per cent. Concerning the area of living, women who reside in urban areas have higher wages than women in rural areas, which is 71 per cent of the men's total earnings in urban areas. Meanwhile, the differences in the average hourly wage for men in rural and urban areas appear insignificant compared to the average hourly wage for women.

In the sector of segregation, men have a higher average hourly pay in almost all sectors than women except in real estate and government administration. Women may have more opportunities to obtain higher earnings if they work in the following sectors such as mining, transportation, business services (financial & insurance, real estate, and firm assistance), and government. The highest average hourly pay for women is in the real estate sector and finance & insurance for men.

Table 3: Mean Wage per Hour for Men and Women

Mean Wage per Hour	Men	Women	Ratio W/M
Education			
Primary	10,769.6	7,164.4	67 %
High School	11,656.1	8,154.7	70 %
College	17,283.2	11,533.7	67 %
Area			
Rural	10,639.1	6,937.4	65 %
Urban	11,459.0	8,189.1	71 %
Sectors			
Agriculture	9,980.1	6,890.8	69 %
Mining	12,300.7	10,249.7	83 %
Manufacture	10,459.9	6,559.2	63 %
Electricity and Gas	13,846.9	7,975.2	58 %
Water, Waste and Recycle	10,313.9	5,666.2	55 %
Construction	11,360.6	9,782.7	86 %
Wholesale	10,550.5	7,778.6	74 %
Transportation	13,084.0	12,137.4	93 %
Accommodation & Food	9,516.1	7,538.5	79 %
Information & Communication	11,847.5	7,682.2	65 %

Mean Wage per Hour	Men	Women	Ratio W/M
Finance & Insurance	15,801.0	13,624.3	86 %
Real Estate	15,064.8	31,476.6	209 %
Firm Service	13,381.7	11,228.5	84 %
Government Administration	10,694.6	11,334.0	106 %
Education	10,341.5	8,476.0	82 %
Health & Social Services	11,241.3	8,944.4	80 %
Other Services	12,141.2	7,916.5	65 %

Source: Author's calculation

In terms of education, male workers have a higher proportion of wage at all level of education, except at a higher education level. More than 70 per cent of men have primary education and secondary education levels. In contrast, only around 25% women, have both education levels. However, the proportion of female workers with tertiary educational background, reached more than 50%, whereas men only have around 47,6 per cent share at this level of education.

Table 4: Gender and Education Level

Type of Gender	Education Level (%)			
	No Education	Primary Education	Secondary Education	Tertiary Education
Men	66.1	74.2	70.4	47.6
Women	33.9	25.8	29.6	52.4
Total	100	100	100	100

Source: Author's calculation

In the sector of segregation, female workers in primary and secondary sectors seem underrepresented in informal sectors, such as agriculture, mining, construction, or transportation, compared to men workers. Meanwhile, women's contribution is more evident in some industries, such as accommodation and food, education, health, social services, and other industries. From the share of sectors, the agriculture sector is more dominant with both men and women working in it, accounting for 21.83 per cent, followed by construction at 20.81 per cent and the industry sector at 15.73 per cent.

Table 5: Gender and Type of Sectors

Type of Sectors	Per centage (%)		
	Men	Women	Share by Sector
Agriculture	71.12	28.88	21.83
Mining	95.58	4.42	1.77
Manufacture	64.86	35.14	15.73
Electricity and Gas	92.31	7.69	0.18
Water, Waste, and Recycle	78.49	21.51	0.45
Construction	98.83	1.17	20.81
Wholesale	66.80	33.20	13.56
Transportation	96.35	3.65	4.32
Accommodation & Food	43.85	56.15	4.51

Type of Sectors	Per centage (%)		
	Men	Women	Share by Sector
Information & Communication	62.60	37.40	0.46
Finance & Insurance	69.21	30.79	0.64
Real Estate	82.77	17.23	0.27
Firm Service	81.10	18.90	1.72
Government Administration	71.91	28.09	0.61
Education	30.17	69.83	1.93
Health & Social Services	31.73	68.27	0.60
Other Services	36.23	63.77	10.63

Source: Author's calculation

Tables 6 and 7 illustrate the unconditional RIF for both men and women at three percentiles: the 10^{th}, 50^{th}, and 90^{th} percentiles. The interpretation of this method is slightly similar to ordinary least squares estimation, in which the coefficient estimates of each variable refer to the marginal effects of explanatory variables. In the median percentiles, men who are the head of a family have 9 per cent higher earnings than men who are not the head of the family. Similarly, married men had 9 per cent higher wages than unmarried men. In regards to education, men who completed high school have higher earnings than men who only have a primary education background, accounting for 10 to 13 per cent in all percentiles. The return to education for college-level men rose from the lower percentiles to the upper percentiles, which is 56 per cent higher than men who completed the primary school level in the 90^{th} percentile.

Table 6: Men's Recentered Influence Function

Variables	Coef.	t stats	Coef.	t stats	Coef.	t stats
	10th		50th		90th	
exper	0.004***	6.210	0.002***	7.350	0.002***	3.770
training	-0.046*	-2.010	-0.034**	-3.000	-0.116***	-5.920
area	0.097***	9.080	0.033***	6.950	-0.002	-0.370
headhh	0.082***	5.510	0.094***	13.840	0.120***	13.020
marrital	0.153***	9.670	0.091***	13.190	0.062***	6.740
highsch	0.105***	9.090	0.101***	18.770	0.135***	16.590
college	0.151***	4.710	0.247***	16.420	0.560***	17.760
manufacture	0.220***	12.190	0.043***	5.220	-0.019	-1.820
mining	0.241***	17.300	0.224***	37.240	0.007	0.810
trade	0.164***	8.520	0.028***	3.270	-0.002	-0.210
transport	0.161***	8.110	0.115***	12.970	0.169***	12.160
business	0.143***	4.120	0.167***	10.740	0.273***	9.940
services	-0.057*	-2.200	0.024*	2.280	0.100***	6.290
_cons	7.964	285.350	8.925	692.200	9.717	455.450

Note: standard errors in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Author's calculation

In terms of sectors, men working in the business or transport sector earn 10 per cent higher than men in the agriculture sector in all percentiles. The marginal effect is higher in the lower percentiles than

in the higher parts of the living areas. Men in urban areas have around 22 per cent higher earnings than men in rural areas. However, this marginal effect decreases in the higher wage percentiles, which is only about 3 per cent in the 90th percentile.

For women, in the education variable, the marginal effect of high school and college is more elevated than their male counterparts, except in the 10th percentile. In detail, women who completed high school have more than 10 per cent higher earnings in the 50th and 90th percentiles compared to women with only primary education, which are about 14 per cent and 17 per cent, respectively. Similarly, women with a college education have 24 per cent and 66 per cent higher earnings than women who only completed primary school. In terms of marital status, married women also have higher income at about 11 per cent in the median percentile. Its marginal effect rises to about 15 per cent in the higher percentiles of women who are not married. Like men, working in business services (finance, insurance, or firm service) in the informal sector contributes to a higher return in earnings than other sectors, which is about 64 per cent higher in the upper percentiles.

Meanwhile, the effect of living areas on wage changes decreased as the percentiles moved to a higher distribution. Women living in urban areas have about 21 per cent higher income than women living in rural areas in the 10th percentile, and this marginal effect declines to only 10 per cent in the 90th percentile. Experience in the informal sector does not affect the wage for women in all percentiles, but it has a negligible effect on the men's wage changes.

Table 7: Women's Recentered Influence Function

Variables	Coef.	t stats	Coef.	t stats	Coef.	t stats
	10th		50th		90th	
exper	0.003*	2.530	0.001*	2.240	0.001	1.600
training	0.030	1.040	-0.050**	-2.930	-0.154***	-4.520
area	0.205***	12.400	0.134***	14.780	0.104***	7.790
headhh	0.060**	2.660	0.089***	6.750	0.121***	5.900
marrital	0.066***	3.840	0.106***	10.490	0.153***	9.460
highsch	0.124***	7.220	0.141***	13.290	0.174***	9.900
college	-0.055	-1.710	0.235***	13.260	0.662***	16.480
manufacture	-0.155***	-5.500	-0.132***	-9.560	-0.090***	-4.820
mining	0.033	0.580	0.178***	5.990	0.228***	4.070
trade	0.154***	5.600	-0.050**	-3.220	0.012	0.510
transport	0.167***	6.090	-0.035*	-2.080	-0.009	-0.370
business	0.340***	9.500	0.235***	8.530	0.636***	9.030
services	0.078***	3.400	-0.089***	-7.020	0.019	0.980
_cons	7.572***	199.880	8.596***	392.630	9.375	231.720

Note: standard errors in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Author's calculation

Prior to performing the analysis, we divided the sample into three groups: pooled (114.020 samples), employees (74.293 samples), and casual workers (39.727 samples). The analysis aimed to find the general condition of the gender gap and the characteristics of the employee and casual workers. The gender wage gap is higher at the lower bottom of the distribution in the pooled group and decreases after the 50th percentile. However, the sticky floor effect is not general because the wage gap between the 10th and 25th is lower than 2 per cent.

In the 10th percentile, the differences in characteristics can explain 30,4 per cent (0,144) of the gender wage gap compared to the structure effect, which can only describe 69,6 per cent (0,329) of the gender wage gap. However, at the upper wage distribution, the composition effect decreases significantly to only about 8,7 per cent (0,0271). The result implies that at the top wage distribution, the gap in

characteristics between gender only describes a small portion of the gender wage gap. The wage structure effect with discrimination or excluded variables becomes prominent to induce the gap. Consequently, the characteristic difference decreasing along the wage distribution suggests that women can narrow the gender wage gap by almost one-third at the bottom wage distribution if they are not subject to discrimination or other factors.

Table 8: Decomposition of Gender Wage Gap of Pooled Samples at Percentiles

	10th	**25th**	**50th**	**75th**	**90th**
Gender wage gap	0,473	0,491	0,470	0,390	0,311
Composition Effect	0,144	0,146	0,118	0,0653	0,0271
Structure Effect	0,329	0,345	0,352	0,324	0,284
Explained					
exper	0,002	0,001	0,001	0,000	0,000
training	-0,001	-0,001	-0,001	-0,001	-0,003
area	-0,010	-0,007	-0,003	-0,002	0,000
headhh	0,069	0,062	0,060	0,055	0,066
marrital	0,016	0,014	0,009	0,007	0,006
highsch	0,000	0,000	0,000	0,000	0,000
	10th	**25th**	**50th**	**75th**	**90th**
college	-0,005	-0,008	-0,009	-0,013	-0,022
manufacture	-0,010	-0,005	-0,002	0,000	0,001
mining	0,073	0,086	0,069	0,032	0,001
trade	-0,005	-0,003	-0,001	0,000	0,000
transport	-0,001	-0,003	-0,001	-0,001	-0,001
business	0,001	-0,003	0,001	0,001	0,001
services	0,015	-0,003	-0,005	-0,013	-0,022

Source: Author's calculation

Table 9 shows the Recentered Influence Function (RIF) decomposition in five percentiles: 10th, 25th, 50th, 75th, and 90th -percentiles for the employee group. The gender wage gap is higher in the lower percentiles compared to that in the upper percentiles. In the 10th percentile, the gender wage gap accounts for 45 per cent log points, which increases to 48 per cent log points in the 25th percentile. However, the gap decreases to about 29 per cent log points in the 90th percentiles at the upper percentiles. Thus, this study found no sticky floor effect in the employee category.

Table 9: Decomposition of Gender Wage Gap at Percentiles for Employees

	10th	**25th**	**50th**	**75th**	**90th**
Gender wage gap	0,446	0,477	0,484	0,394	0,290
Composition Effect	0,176	0,165	0,125	0,070	0,0261
Structure Effect	0,271	0,312	0,359	0,324	0,264
Explained					
exper	-0,001	-0,001	0,000	0,000	0,001
training	-0,002	-0,001	-0,001	-0,002	-0,004
area	-0,010	-0,006	-0,004	-0,002	-0,002
headhh	0,069	0,071	0,060	0,059	0,062
marrital	0,020	0,017	0,011	0,008	0,007
highsch	-0,002	-0,002	-0,002	-0,002	-0,002
college	-0,007	-0,012	-0,013	-0,019	-0,030
manufacture	-0,003	-0,002	0,001	0,002	0,002
mining	0,056	0,065	0,052	0,018	0,004

	10th	25th	50th	75th	90th
trade	-0,002	0,000	0,002	0,002	0,002
transport	0,000	0,000	0,000	0,000	-0,001
business	0,000	0,001	0,001	0,001	0,002
services	0,058	0,037	0,019	0,005	-0,014

Source: Author's calculation

Although the gender wage gap tends to decrease as percentiles move to the top, the composition effect seems to experience a decline. In the 10th percentiles, almost 18 per cent log points (40 per cent of the total wage gap), the gender wage gap occurs due to the gap in individual characteristics between male and female employees in the informal sector. In 50th percentiles, the covariates only describe 13 per cent log points of the gender wage gap (26 per cent). Furthermore, in the 90th percentile, only about 3 per cent log point (9 per cent) characteristics can explain the difference in wages between the two types of gender. The lower gender wage gap at the upper wage distribution indicates that women may have higher incomes without discrimination.

The structure effect still dominates the portion of the gap compared to the composition effect, ranging from 60 per cent log points to 91 per cent log points. The negative value for the composition effect means that women have more characteristics than men, while the positive value means otherwise. The segregation sector can describe the gender wage difference for employment in the informal sector. Mining, energy, and construction are other variables that contribute to men's higher wages. This sector shows a high wage ratio of men per women at 84 per cent or 23,21 per cent of all sample work in these sectors. For women, the return to education at the college level increases as the wage distribution moves to higher percentiles. It indicates that women should invest more in higher education to reduce the wage gap between them and their male counterparts. Meanwhile, marital status also significantly affects the gender wage gap. Married men tend to have a positive contribution of about 2 per cent to the gender wage gap at the lower-wage distribution.

The head of the household variable significantly extends the pay gap between men and women. Becoming the head of a household contributes to an average of 6 log points in all wage distribution because this role implies that men or women have a responsibility as a breadwinner. Furthermore, the head of a family has the power and influence on decision-making related to asset and income allocation. In Indonesian culture, men are generally the primary breadwinner while women are expected priority is to manage the household. One factor that affects the gender wage gap in Indonesia is that women may have less influence on decision-making and have fewer opportunities to invest in human capital, such as education.

Table 10: Decomposition of Gender Wage Gap at Percentiles for Casual Worker

	10th	25th	50th	75th	90th
Gender wage gap	0,533	0,556	0,503	0,424	0,341
Composition Effect	0,154	0,167	0,149	0,094	0,051
Structure Effect	0,378	0,389	0,354	0,33	0,29
Explained					
exper	0,016	0,014	0,011	0,008	0,011
training	0,000	0,000	0,000	0,000	0,000
area	0,001	0,001	0,000	0,000	0,000
headhh	0,053	0,046	0,047	0,045	0,049
marrital	0,005	0,004	0,003	0,002	0,001
highsch	0,001	0,003	0,004	0,005	0,007
college	0,000	0,000	0,000	0,000	0,000
manufacture	-0,002	-0,001	-0,001	0,001	0,001
mining	0,084	0,109	0,093	0,046	-0,007
trade	0,000	0,000	0,000	0,000	0,000
transport	0,004	0,004	0,004	0,004	0,006

	10th	25th	50th	75th	90th
business	-0,001	0,000	0,000	0,000	0,001
services	-0,006	-0,012	-0,013	-0,018	-0,018

Source: Author's calculation

In casual workers groups, the sticky floor effect is significant. Casual work negatively affects women's individual incomes compared to the potential earnings of full-time employees (Pennington, 2021). The gender wage gap in the 10th percentile is 53 per cent log points, which rises to 56 per cent log points in the 25th percentile before a decline to 50 per cent log points in the 25th percentile. This condition satisfies the sticky floor effect, referring to the wage gap between the 10th and 50th percentiles of more than 2 per cent of log points (Arulampalam et al., 2007). It suggests that women who receive lesser hourly earnings might suffer from immense discrimination without legal regulations such as minimum wage.

As opposed to full-time employment, women in casual work are generally dictated to the times and terms of work by the contract employer. As a result, women with children or other household responsibilities may find it difficult to manage their own work hours due to the potential of irregular and unpredictable work hours or schedules. In addition, the gender wage gap for casual workers in the informal sector is higher than that of full-time employees for all percentiles. The apparent difference is the significant and positive sign of experience favouring men in casual workers. It may be due to the natural characteristics of casual workers who have different experiences in different jobs. Although both dummies had a positive sign that denotes the return favour for men's wage, the magnitude is too small in the education variable.

Discussions

In terms of education, a negative sign in decomposition implies that women are more qualified than men, especially those with a tertiary education background. This study found that women can reduce the gender wage gap across wage distribution when they have high education. This result is in accordance with the study of Psacharopoulos and Patrinos (2004), in which higher education (secondary and tertiary) gives more return to women compared to men. Education for women is expected to diminish the wage gap and boost women's participation in the labour market (Chaykowski & Powell, 1999; Bobbitt-Zeher, 2007). The magnitude of college attainment also becomes more prominent as the wage moves to the upper-level distribution. Landmesser (2019) stated that higher average levels of education among women reduce income inequalities. As the gender wage gap becomes smaller in the wage distribution, individual characteristics that explain the sources of the wage gap also reduce. Education is the most effective way for women to narrow the gender pay gap.

This study found that there is a marriage premium among men who serve as the primary breadwinner for the family. This is consistent with the previous studies, which suggest that married men tend to gain an advantage in income compared to unmarried men (Korenman & Neumark, 1991; Juhn & McCue, 2017). Married men in the 10th percentile have the highest return compared to men at the upper level. The theoretical reason for the relationship between marital status and wages is that men tend to become more productive due to the process of household allocation between spouses (Becker, 1981; 1985; Korenman & Neumark, 1991). However, the magnitude of marriage premium for men tends to decrease along the wage distribution.

Meanwhile, the effect of marriage on women's wages in the informal sector along the wage distribution is well established in comparison to men's wages. While the positive effect of marital status on women results in wages premium (McConnell & Valladares-Esteban, 2021), others claimed that marital status is not related to women's wages (Bonnet et al., 2022; Hewitt et al., 2002). Women's marriage premium in the informal sector shows different trends in wage distribution compared to men's case. The return of marriage for women's wages rises from the bottom wage distribution to the upper wage distribution. Married men are in a favourable position to earn more wages than women. Married women seem to have fewer hours as they have an unbalanced division of labour within the household.

A significant number of researchers claimed that the role of occupational segregation is still dominant in creating the gender wage gap (Blau & Kahn, 2007; England et al., 2000). The occupational segregation in this study also contributed to the gender wage gap. Men are obviously dominant in all sectors except in real estate and government administration. Furthermore, some studies showed various mixed results when calculating the relationship between occupational segregation and the gender wage

gap. While Polachek (1987) argued that occupational segregation only contributes a minor role in explaining the gender wage gap, Hegewisch and Hartmann (2014) claimed that occupational segregation should prioritise narrowing the gender wage gap.

Our findings show that the unobserved variables, such as discrimination, are a prominent cause of the gender wage gap along the wage distribution. The presence of discrimination has to be carefully explained as we need to consider unexplained factors, such as social norms or cultural factors, that may affect the gap. The unsolved factors were difficult to explain comprehensively in this study as relevant data were unavailable. From this point, the estimated size of 'discrimination' can consequently be used on the weight of any omitted exogenous variables and other unobserved variables that may influence wages.

Conclusions

This paper investigated the phenomenon of the gender wage gap in the informal sector throughout the wage distribution in Indonesia using the Indonesian National Labour Force Surveys (SAKERNAS) data during 2019. Recentered Influence Function (RIF) regression and decomposition were applied for two separate categories of occupation: full-time employees and casual workers.

Women earn lower wages than men, and the sticky floor effect on employment in the informal sector is weak. While the gender wage gap among employees is higher in the median wage distribution, the sticky floor effect only appears in the casual worker category. However, each quantile's wage structure effect is prominent, and the magnitude increases from the bottom to the upper distribution. From all independent characteristics, human capital variables, especially education, become prominent for women to help them reduce the wage gap between them and men. In contrast, men favour the sector of segregation to increase the income difference in general.

This study had a policy implication: to enhance access to education and improve human capital through higher education for future gain. Furthermore, the educational investment would be a significantly effective policy for the economy and society. Policymakers should also provide more access to a better-paid sector that remunerates their skills as much as men. This study also had a limitation because the sample selection correction cannot be utilised due to the lack of proper variables in the data. Future research should include sample selection correction to quantify the actual dynamics of the gender wage gap in the labour market.

Acknowledgements

This research was done as a requirement to obtain the Master's degree certificate from the Joint Linkage Program Scholarship of the University of Indonesia and the National Graduates Institute for Policy Studies (GRIPS). The author would like to thank the BAPPENAS or Indonesia's Government National Development Planning Agency for funding this research. The author would also like to extend sincere gratitude to Mr Toshihiro Kudo from GRIPS for his support, guidance, and supervision during the completion of this research.

References

Albrecht, J., Björklund, A., & Vroman, S. (2003). Is there a glass ceiling in Sweden? *Journal of Labor Economics*, *21*(1), 145–177. https://doi.org/10.1086/344126

Arulampalam, W., Booth, A. L., & Bryan, M. L. (2007). Is there a glass ceiling over Europe? Exploring the gender wage gap across the wage distribution. *Industrial and Labor Relations Review*, *60*(2), 163–186. https://doi.org/10.1177/001979390706000201

Becker, G. (1981). *A treatise on the family*. Harvard University Press.

Becker, G. (1985). Human capital, effort, and the sexual division of labor. *Journal of Labor Economics*, *3*(1, part 2), S33–S58.

Blau, F. D., & Kahn, L. M. (2000). Gender differences in pay. *Journal of Economic Perspectives*, *14*(4), 75–99. https://doi.org/10.1257/jep.14.4.75

Blau, F. D., & Kahn, L. M. (2007). The gender wage gap. *The Economists' Voice*, *4*(4). https://doi.org/10.2202/1553-3832.1190

Blinder, A. S. (1973). Wage discrimination: Reduced form and structural estimates. *The Journal of Human Resources*, *8*(4), 436–455. https://doi.org/10.2307/144855

Bobbitt-Zeher, D. (2007). The gender income gap and the role of education. *Sociology of Education*, *80*(1), 1–22. https://doi.org/10.1177/003804070708000101

Bonnet, C., Jeandidier, B. & Solaz, A. (2018). Wage premium and wage penalty in marriage versus cohabitation. *Revue D'économie Politique*, *128*, 745–775. https://www.cairn-int.info/journal--2018-5-page-745.htm.

Badan Pusat Statistik Indonesia. (2018). Laporan survei pekerja informal (SPIN) 2018. 120.

Chaykowski, R.P., & Powell, L. P. (1999). Women and the labour market: Recent trends and policy issues. *Canadian Public Policy*, *25*, S1–S25. https://doi.org/10.2307/3552314

De la Rica, S., Dolado, J., Llorens, V., Llorens, V., & Dolado Llobregad, J. (2005). Ceiling and floors? Gender wage gaps by education in Spain. DFAE-II WP Series, 1, 1.

England, P., Hermsen, J.M., & Cotter, D.A. (2000). The devaluation of women's work: a comment on Tam. *American Journal of Sociology*, *105*(6), 1741–1751.

Fang, Z., & Sakellariou, C. (2011). A case of sticky floors: Gender wage differentials in Thailand. *Asian Economic Journal*, *25*(1), 35–54. https://doi.org/10.1111/j.1467-8381.2011.02047.x

Firpo, S. P., Fortin, N. M., & Lemieux, T. (2009). Unconditional quantile regressions. *Econometrica*, *77*(3). 953–973. https://doi.org/10.3982/ECTA6822

Firpo, S. P., Fortin, N. M., & Lemieux, T. (2018). Decomposing wage distributions using recentered influence function regressions. *Econometrics*, *6*(2), 1–40. https://doi.org/10.3390/econometrics6020028

Fortin, N., Lemieux, T., & Firpo, S. (2011). Decomposition methods in economics. *Handbook of Labor Economics*, *4*, 1–102. https://doi.org/10.1016/S0169-7218(11)00407-2

Hegewisch, A., & Liepmann, H. (2013). Occupational segregation and the gender wage gap in the US. In D. M. Figart & T. L. Warnecke (Eds.), *Handbook of Research on Gender and Economic Life*, 200–217. Edward Elgar Publishing. https://doi.org/10.4337/9780857930958.00024

Hennigusnia. (2014). Kesenjangan upah antarjender di Indonesia: Glass ceiling atau sticky floor. *Jurnal Kependudukan Indonesia*, *9*(2), 83–96.

Hewitt, B., Western, M.C., & Baxter, J. (2002). Marriage and money: The impact of marriage on men's and women's earnings. *Discussion Paper DP-007*..

International Labour Organization. (2018). Global wage report 2018/19: What lies behind gender wage gaps. https://www.ilo.org/global/publications/books/WCMS_650553/lang--zh/index.htm

Juhn, C., & McCue, K. (2017). Specialisation then and now: Marriage, children, and the gender earnings gap across cohorts. *Journal of Economic Perspectives, 31*(1), 183–204. https://doi.org/10.1257/jep.31.1.183

Kassenboehmer, S. C., & Sinning, M. G. (2014). Distributional changes in the gender wage gap. *Industrial and Labor Relations Review*, *67*(2), 335–361. https://doi.org/10.1177/001979391406700203

Korenman, S., & Neumark, D. (1991). Does marriage really make men more productive?.

Journal of Human Resources, 26(2), 282–307. https://doi.org/10.2307/145924

Landmesser, J. M. (2019). Decomposition of gender wage gap in poland using counterfactual distribution with sample selection. *Statistics in Transition New Series*, *20*(3), 171–186.

Mardiana, M. (2015). Kesenjangan penghasilan antar gender di Indonesia tahun 2013 dengan metode dekomposisi blinder-oaxaca. *Jurnal Aplikasi Statistika & Komputasi Statistik*, *7*(1), 20. https://doi.org/10.34123/jurnalasks.v7i1.116

McConnell, B., & Valladares-Esteban, A. (2021). On the marriage wage premium.

Oaxaca, R. (1973). Male-female wage differentials in urban labor markets. *International Economic Review*, *14*(3), 693–709.

Organisation for Economic Cooperation and Development. (2020). Can collective bargaining help close the gender wage gap for women in non-standard jobs? 1–13.

Psacharopoulos, G., & H. A. Patrinos. (2004). Returns to investment in education: A further update. *Education Economics*, *12*(2), 111–134. https://doi.org/10.1080/0964529042000239140

Pennington, A. (2021). Briefing paper: Women's casual job surge widens gender wage gap. March 1–10. https://australiainstitute.org.au/wp-content/uploads/2021/03/Womens-Casual-Job-Surge-Widens-Gender-Wage-Gap-CFW.pdf

Pirmana, V. (2006). Earnings differential between male-female in Indonesia: Evidence from sakernas data. Center for Economics and Development Studies (Issue 6).

Polachek, S.W. (1987). Occupational segregation and the gender wage gap. *Population Research and Policy Review*, *6*, 47–67. https://doi.org/10.1007/BF00124802

Pooittiwong, A. (2017). Informal workers' gender wage gap across thailand's regions and economic sectors. Chicago Booth: Becker Center on Chicago Price Theory.

Ruzik, A., & Rokicka, M. (2012). The gender wage gap in informal employment in Poland. *CASE Network Studies and Analyses No. 406*, 1–37. https://doi.org/10.2139/ssrn.1674939

Sun, H. Y., & Kim, G. S. (2017). Wage structure determinants and gender wage gap among wage earners: From mean to overall log wage distributional decomposition. *Seoul Journal of Economics*, *30*(1), 93–132.

Taniguchi, K., & Tuwo, A. (2014). New evidence on the gender wage gap in Indonesia. *Asian Development Bank Economics Working Paper Series No. 404*. https://doi.org/10.2139/ssrn.2512096

Tannuri-pianto, M., & Pianto, D. M. (2004). Informal employment in Bolivia: A lost proposition? *World Bank*.

Wei, C., & Li, B. (2007). Glass ceiling or sticky floor? Examining the gender wage gap across the wage distribution in Urban China, 1987-2004. Munich Personal RePEc Archive 3544

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 2 - August 2022

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Policy Paper

The Challenges of Physical Special Allocation Fund (SAF) Planning for Sustainable Economic Infrastructure Provision

Andi Setyo Pambudi

Senior Planner, Directorate for Monitoring, Evaluating and Controlling Regional Development, Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

andi.pambudi@bappenas.go.id

ABSTRACT

The paper aimed to examine the relationship between central and regional plan documents, the relevance of the Physical SAF menu to regional development, and how relevant the Physical SAF menu was to the Thematic Assignment of Sustainable Economic Infrastructure Provision (SEIP) to support regional priorities. A quantitative method was used for the analysis. It was carried out in a desk study with content analysis to track the 2021 Physical SAF policy for the assignment of SEIP in the Government Work Plan (GWP) and regional priorities of the Provincial Government Work Plan (PGWP). The results of the planning level analysis showed that there are still some irrelevant Physical SAF policies to the regional priorities for the themes of Tourism, Roads, Small and Medium Industries (SMEs), and the Environment. There are still many plans and activities for the Physical SAF not included in the provincial government's planning, thus affecting the implementation quality.

Keywords: Special Allocation Fund; Regional Development; Sustainable Economic Infrastructure Provision; Indonesia

ARTICLE INFO

Received: May 22, 2022
Received in revised form: August 4, 2022
Accepted: August 29, 2022
doi: 10.46456/jisdep.v3i2.303

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail:
journal.pusbindiklatren@bappenas.go.id

Supported by Indonesian Development Planners Association (PPPI)

1. Introduction

Infrastructure is the backbone of economic growth, which must be strengthened through strategies that promote economic prosperity both at the local and global levels (Khoshnava et al., 2019). Massive infrastructure development carried out in Indonesia in recent times is one of the steps to increase competitiveness and equity to improve the community's welfare (Ervianto, 2019).

Good development planning contributes to achieving a country's development goals effectively. National development is an accumulation of regional developments and is essentially a forum for accumulating development programs (Nazarudin, 2015). Meanwhile, regional development begins with careful and professional planning coordination and is carried out in a synergistic and planned manner toward national development by taking the aspects of sustainability and environment into account (Abbas, 2020; Harrison, 2020; Pambudi, 2020a; GoI, 2004). The fundamental problems in the regional development planning process are still top-down; patterns of thinking tend to be one-way and do not include strategic issues in the regional development planning process (Pambudi et al., 2022; Aziz et al., 2013). On the other hand, regional development planning, including development using central government funding, should reflect the real conditions of a region (Pambudi, 2020b; Setianingsih et al., 2015).

Synchronization of planning in sustainable economic infrastructure provision requires integrating, adjusting, and aligning planning documents to achieve development goals. The national development planning system aims to ensure the integration, synchronization, and synergy across time between regions, spaces, government functions, and central and regional governments (Pambudi & Sitorus, 2021; GoI, 2004). Weak planning coordination (both vertical and horizontal) results in the poor government's ability to execute the development programs and activities and is usually preceded by an inconsistency between the central and regional development planning documents (Abbas, 2020; Volkery et al., 2006). Some indicators of non-optimal coordination in development planning are poor communication and a lack of awareness of executors and coordinators (Abbas, 2020). Therefore, a more comprehensive, targeted, and integrated planning is needed to achieve regional developments and provide equal distribution of economic resources to the community (Fadlina et al., 2013).

A state policy is considered effective when it positively impacts the community; in other words, the community will behave in accordance with the expectations of the government. Therefore, the government needs to ensure that effective policy implementation is carried out through good program design and structure of the implementation process. The Special Allocation Fund (SAF) is part of the government's policy to implement programs that support national priorities, including regional affairs (Pambudi & Putri, 2022). The allocation of transfer funds can be in the form of (1) Balancing Funds (General Transfer Funds, General Allocation Funds, Profit Sharing Funds, and Special Transfer Funds (SAF, both physical and non-physical); (2) Regional Incentive Funds (DID); (3) Special Autonomy or Autonomy Funds; Privileges Fund (D.I Yogyakarta Province); and (4) Village Funds. From various studies, SAF has the most significant influence on economic growth, among other types of transfer funds currently available (Juanda & Handa, 2017). The SAF budget is aimed at long-term investment activities, short-term investments, regional performance improvement, repair, and improvement of public service facilities and infrastructure classified as national priorities with long economic life and included in capital expenditure (Sukarna et al., 2012; Shadrina & Putri, 2019). Physical SAF aims to encourage public service facilities and infrastructure provision, fulfilment of Minimum Service Standards (MSS) and the achievement of the National Priority of PGWP in 2021. The acceleration of regional and regional development of general policy directions for the 2021 Physical SAF to support economic recovery after the COVID-19 included the followings: 1) Physical Special Allocation Funds were prioritized for activities with direct impacts on labour absorption and the ability to increase people's purchasing power in response to the COVID-19 pandemic; 2) Provision of sustainable infrastructure for economic recovery at the national level after the COVID-19 pandemic.

It is interesting to analyze the development of economic infrastructure provision in the regions funded by Special Allocation Funds (SAF) from the planning aspect as the basis for future improvement. More specifically, the evaluation of planning synchronization needs to identify how far the Physical SAF supports priority programs in the regions in a desk analysis on the central-regional planning gap in the implementation of Physical SAF Assignments, especially in Sustainable Economic Infrastructure Provision

(SEIP). As in the regulations made in 2021, the current SAF includes four fields: Tourism, Small and Medium Industry (SMI), Roads, and the Environment Sub-sector (GoI, 2020a; GoI, 2020b). The paper aimed to examine the relationship between Central and Regional Government Work Plan documents, the relevance of the Physical SAF menu to regional development, and how relevant the Physical SAF menu was to the Thematic Assignment of Sustainable Economic Infrastructure Provision to support regional priorities. The benefit of this analysis was that it provided information for the central and local governments to plan adaptive SAF that can accommodate the needs of local and central governments by implementing bottom-up and top-down planning. Good planning is implementable and has an optimal impact on the community as an object of development.

2. Methodology

A quantitative method was adopted for the analysis. It was carried out in a desk study with content analysis to track the 2021 Physical SAF policy for the assignment of Sustainable Economic Infrastructure Provision in the Government Work Plan (PGWP) and regional priorities of the Provincial Government Work Plan (PGWP). The secondary data used were policy documents at the central level (PGWP) and the regional level (PGWP), especially those from provinces that received the Physical SAF budget allocation for SEIP for the Fiscal Year 2021. For data analysis and processing, a proportional preference approach was utilized to describe the frequency of conditions for the data population. An overview of the effectiveness was presented using a planning gap analysis, whereas the suitability of regional priorities was described using content analysis as an instrument to reach a conclusion. To analyze the effectiveness, budget data were also used to see how the regional development agenda is in synergy with the national development agenda. The Assignment Physical SAF study was carried out only on 2021 data with the consideration of the thematic suitability in line with one of the government's strategies to handle the National Economic Recovery (NER) during and after the COVID-19 pandemic.

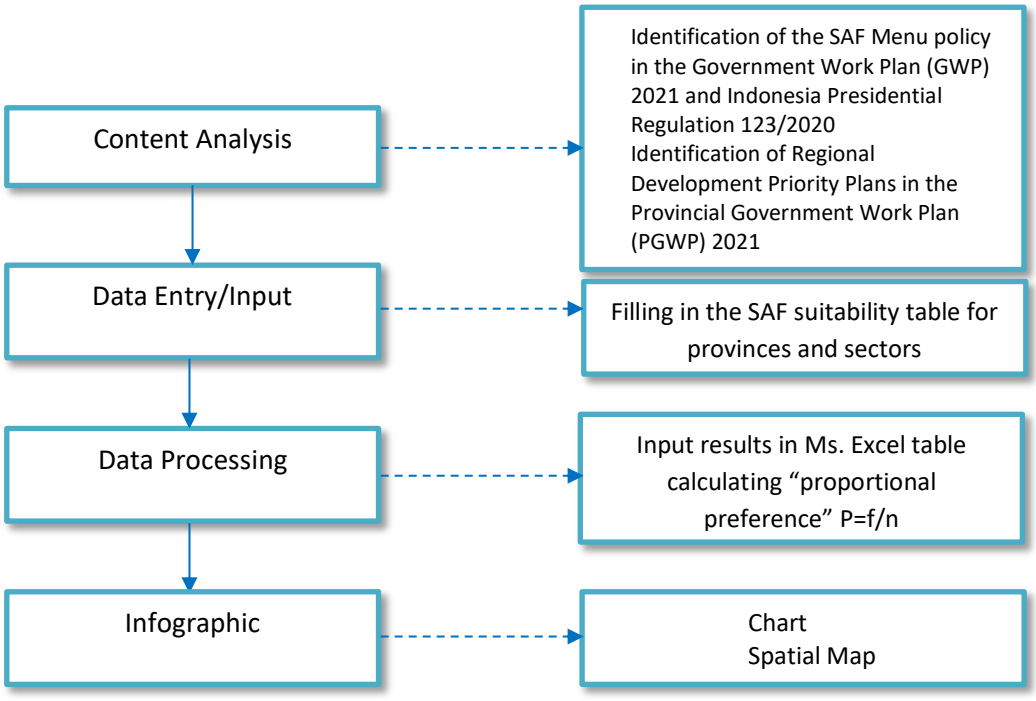


Figure 1. Gap Analysis Approach to Central-Regional Planning for Physical SAF Implementation with Thematic Assignment of Sustainable Economic Infrastructure Provision for the Fiscal Year 2021 (Source: Analysis Result, 2021)

Using the quantitative method, some data on the SAF Physical budget allocation were compared with the Regional Revenues and Expenditure budget allocation to figure out the extent of the Regional Priority Index in some regions of the Physical SAF. These analyses also used a spatial analysis (by Geographical Information System/ GIS) as a regional analysis infographic. The information on the

suitability and non-suitability of the Special Allocation Fund (SAF) Menu in the Government Work Plan with the Provincial Government Work Plan can be accessed through the activity menu in the Physical SAF in each field, which was then examined through the tagging table of the Special Allocation Fund-Regional Development Work Plan made by the author. Tagging describes the Special Allocation Fund field and its menu of activities. Each menu of activities in each field was evaluated for suitability and non-suitability through regional programs in each province's Regional Government Work Plans. After filling the tagging table for all regions, the tagging results were recapitulated with the distribution of each activity menu. Based on these, the conclusions and suitability/non-suitability results of the menu of activities in each field of all provinces through their regional programs were obtained. Spatially, regions with overall regional program suitability with the Special Allocation Fund menu were coloured green. Meanwhile, those that were "not suitable" were coloured red, while those with partial suitability were in orange colour.

3. Results and Discussion

Policy internalization in the planning process is a crucial issue in the series of development implementations. In the preparation of planning, the central and local governments use Law No. 25 of 2004 concerning the National Development Planning System as a legal basis (GoI, 2020b; GoI, 2004). National development planning is a unified development planning procedure to produce long-term, medium-term and annual development plans implemented by government administrators at the central and regional levels (Pambudi et al., 2022). This planning gap analysis illustrates how SAF policies are internalized in regional development. Thematic Physical SAF for the Provision of Sustainable Economic Infrastructure focused on infrastructure improvement to accelerate economic recovery after the COVID-19 pandemic. The analysis was conducted within the scope of provinces that received physical SAF allocations with Thematic Assignments of the Provision of Sustainable Economic Infrastructure (SEIP). The thematic assignments consisted of several sectors, namely the Tourism Sector (20 provinces), Small and Medium Industry Sector (32), Road Sector (31), and the Environment Sub-Sector (8).

3.1 Internalization of SAF Policy in Tourism Development Planning

The Government Work Plan for Fiscal Year 2021, as stated in Presidential Regulation 122 of 2020, allocated thematic policies of Physical Assignment SAF, one of which was to provide sustainable economic infrastructure in the tourism sector (GoI, 2020a; GoI, 2020b). It is further stated in the Presidential Regulation No. 123 of 2020 concerning Technical Guidelines for Physical SAF for Fiscal Year 2021 that the Tourism Sector has 5 (five) activity menus, namely: 1) Development of Tourism Area Amenity; 2) Development of the Tourist Pier Area; 3) Open Area Development; 4) Development of Tourist Tracks; and 5) Development of Supporting Facilities for Rural/Urban Tourism Areas. The Special Allocation Fund for Tourism for the Fiscal Year 2021 also had regional priorities, namely: 1) Ten National Priority Tourism Destinations, namely Lake Toba, Borobudur, Mandalika, Wakatobi, Labuan Bajo, Likupang, Bromo-Tengger-Semeru, Raja Ampat, Tanjung Kelayang, and Morotai Island; 2) Eight Development Tourism Destinations covering Batam-Bintan, Bukit Tinggi-Padang, Bandung-Halimun-Ciletuh, Banyuwangi, Sambas-Singkawang, Derawan-Berau, Toraja-Makassar-Selayar, and Biak-Cendrawasih Bay; and 3) Revitalizing Bali Destinations in accordance with Presidential Regulation No. 18 of 2020 concerning the 2020-2024 National Mid-Term Development Plan.

Table 1: Menu of Suitability of Physical SAF Assignments in the Tourism Sector with Regional Priorities for the Fiscal Year 2021

Provinces	Menu of Suitability of Physical SAF Assignments in the Tourism Sector with Regional Priorities					%
	Development of Tourism Area Amenity	Development of the Tourist Pier Area	Open Area Development	Development of Tourist Tracks	Development of Supporting Facilities for Rural/Urban Tourism Areas	
Aceh	✔	✔	✔	✔	✔	100

Provinces	Menu of Suitability of Physical SAF Assignments in the Tourism Sector with Regional Priorities					%
	Development of Tourism Area Amenity	Development of the Tourist Pier Area	Open Area Development	Development of Tourist Tracks	Development of Supporting Facilities for Rural/Urban Tourism Areas	
North Sumatra	✔	✔	✔	✔	✔	100
West Sumatra	✔	✔	✔	✔	✔	100
Bangka Belitung	✔	✔	✔	✔	✔	100
Riau islands	✔	✔	✔	✔	✔	100
Banten	✔	✔	✔	✔	✔	100
West Java	✔	✔	✔	✔	✔	100
Central Java	✔	✔	✔	✔	✔	100
DIY	✔	✔	✔	✔	✔	100
East Java	✔	✔	✔	✔	✔	100
West Kalimantan	X	X	X	X	X	0
North Sulawesi	✔	✔	✔	✔	✔	100
South Sulawesi	✔	✔	✔	✔	✔	100
Southeast Sulawesi	✔	X	X	X	✔	40
Bali	✔	✔	✔	✔	✔	100
West Nusa Tenggara	✔	✔	✔	✔	✔	100
East Nusa Tenggara	✔	X	✔	X	X	40
North Maluku	✔	✔	✔	✔	✔	100
Papua	✔	X	X	X	✔	40
West Papua	X	X	X	X	X	100

Source: Analysis Result, 2021

The Physical Special Allocation Fund for the Fiscal Year 2021 with the Thematic Assignment of Sustainable Economic Infrastructure (SEIP) Provision was allocated to 20 provinces to develop the tourism sector. Based on the planning gap analysis results on the issue of conformity to the SAF menu, out of 20 provinces, two provinces did not have regional priority programs relevant to the Physical SAF menu for the Tourism Sector SEIP Assignment, namely West Kalimantan and West Papua, included in the criteria for the location of the Physical SAF budget allocation recipients for the Sustainable Economic Infrastructure Provision of the Tourism Sector for the Fiscal Year 2021. A total of 15 provinces had regional development priority programs in their planning documents that were 100% relevant to the activity menu of Physical SAF Assignments of SEIP in the Tourism Sector, and three provinces only had 40% conformity.

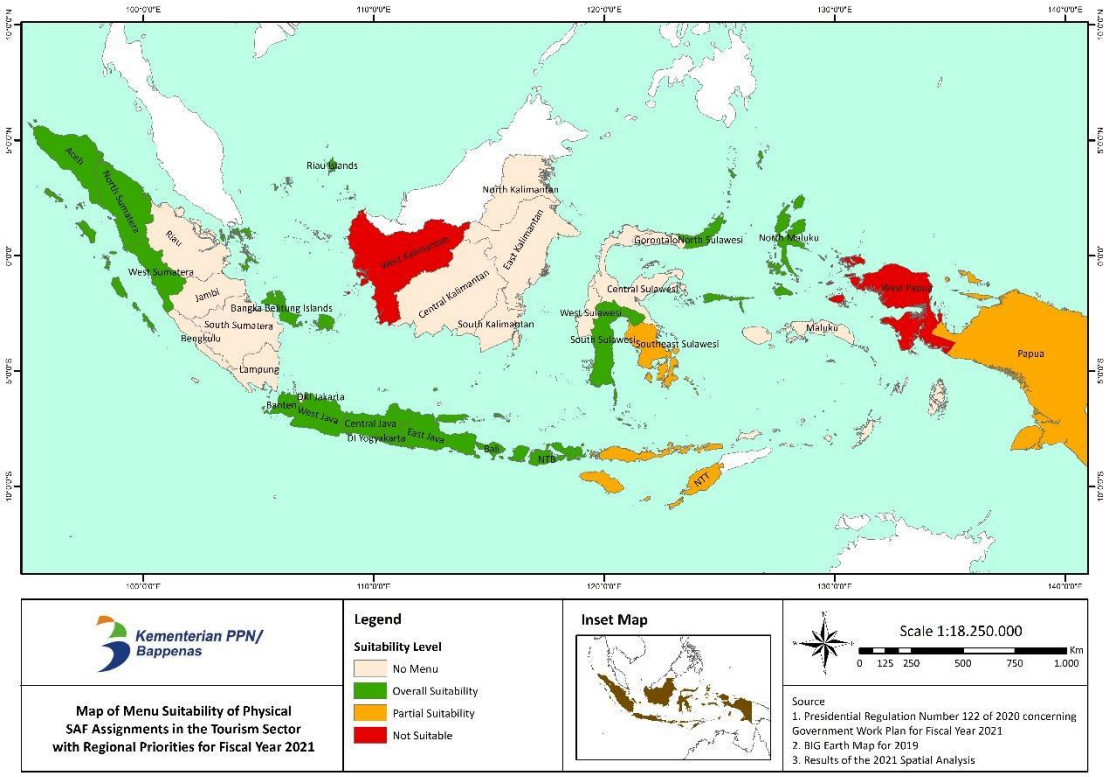


Figure 2. Map of Suitability Menu of Physical SAF Assignments in the Tourism Sector with Regional Priorities for the Fiscal Year 2021 (Source: Analysis Result, 2021)

The diversity of the suitability levels of the menu with regional priorities is shown in Figure 2, in which North Sumatra, Aceh, West Sumatra, Bangka Belitung, Riau Islands, Banten, West Java, Central Java, DIY, East Java, North Sulawesi, South Sulawesi, Bali, West Nusa Tenggara, and North Maluku had an average of 75% suitability, while Southeast Sulawesi, East Nusa Tenggara, and Papua had 15% of partial suitability, and West Kalimantan and West Papua had 10% of unsuitability.

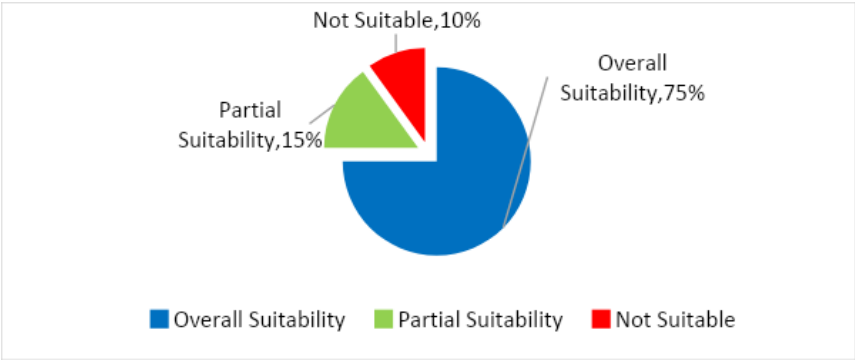


Figure 3. The Proportion of Regional Suitability with Physical SAF Assignments for Tourism Sector for the Fiscal Year 2021 (Source: Analysis Result, 2021)

Based on the gap analysis results, at the level of details of the SAF Thematic Assignment SEIP for the Fiscal Year 2021 menu, various results showed the menu of suitability with regional priorities in the PGWP 2021. The suitability and non-suitability of the Special Allocation Fund (SAF) Menu in the Government Work Plan with the Provincial Government Work Plan can be seen from the activity menu in the Physical SAF in each field, which was then examined through the tagging table of the Special Allocation Fund-

Regional Development Work Plan made by the author. Tagging describes the Special Allocation Fund field and its menu of activities. Each menu of activities in each field was evaluated for suitability and non-suitability through regional programs in each province's Regional Government Work Plans. After filling the tagging table for all regions, the tagging results were recapitulated with the distribution of each activity menu. Based on these, the conclusions and suitability/non-suitability results of the menu of activities in each field in all provinces through their regional programs were obtained.

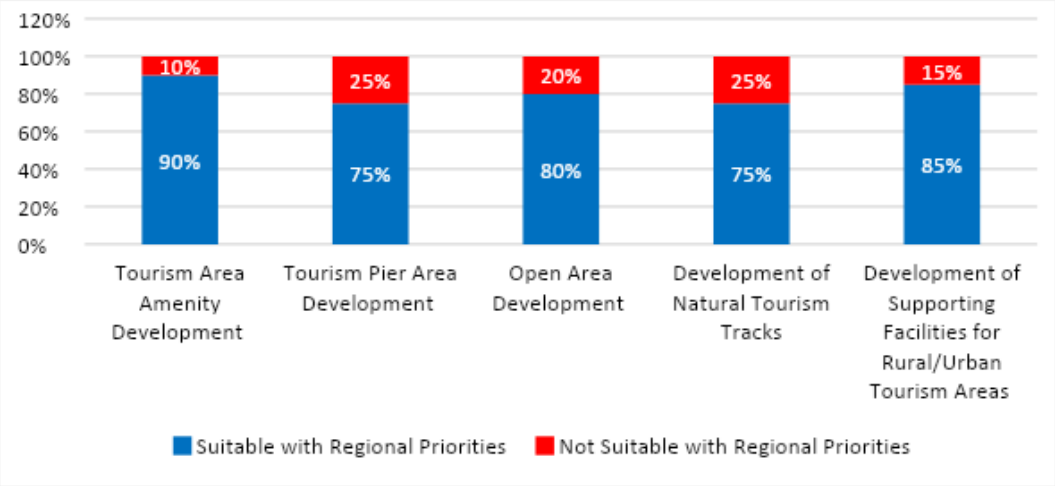


Figure 4. Levels of SAF in the Menu of Suitability with Regional Priorities in Physical SAF Assignments for the Tourism Sector for the Fiscal Year 2021 (Source: Analysis Result, 2021)

It included the Tourism Area Amenity Development activity menu, which had a suitability level of 90%, Tourism Pier Area Development with a suitability level of 75%, Open Area Development with a suitability level of 80%, Development of Natural Tourism Tracks with a suitability level of 75%, and Development of Supporting Facilities for Rural/Urban Tourism Areas with a suitability level of 85%. Tourism Area Amenity Development had the highest level of suitability. It suggests that the issue of Tourism Area Amenity Development was a priority in the regions.

3.2 Internalization of SAF Policy in Small and Medium Industries Development Planning

The Special Allocation Fund for the Assignment of Small and Medium Industries (SMI) had two activity menus, namely, the Development of the SMI Centers and the Revitalization of the SMI Centers. This Special Physical Allocation Fund for the Small and Medium Industries Sector was specifically allocated for the development of the following locations: 1) SMI sector locations/SMI centres affected by the COVID-19 pandemic; 2) Locations based on industrial zoning analysis and SMI development by the Ministry of Industry, areas of 27 Industrial Estates in National Mid-Term Development Plan of 2020-2024 (9 Priority Industrial Estates/Major Projects and 18 Industrial Development Zones) and districts/cities that were directly adjacent; 3) 10 Tourism Destinations; 4) Strategic locations that accelerate the regional economic development; 5) Locations related to the completion of the previous development targets and revitalization of the Physical SAF in the SMI Sector; 6) Areas within the National Priority Rural Areas related to the industry, and 7) the Disadvantaged, Outermost, and Frontier areas.

Table 2: Menu of Suitability of Physical SAF Assignments in the Small and Medium Industry Sector with Regional Priorities for the Fiscal Year 2021

Provinces	Menu of Suitability of Physical SAF Assignments in the Small and Medium Industry Sector with Regional Priorities		%
	Development of the SMI Centers	Revitalization of the SMI Centers	
Aceh	✔	✔	100
North Sumatra	✔	✔	100
West Sumatra	✔	✔	100
Riau	✔	✔	100
Jambi	✔	✔	100
South Sumatra	✔	✔	100
Bengkulu	✔	✔	100
Lampung	✔	✔	100
Bangka Belitung	X	X	0
Riau islands	✔	✔	100
Banten	✔	✔	100
West Java	X	X	0
Central Java	X	X	0
DIY	✔	✔	100
East Java	✔	✔	100
West Kalimantan	X	X	0
Central Kalimantan	✔	✔	100
South Kalimantan	✔	✔	100
East Kalimantan	✔	✔	100
North Kalimantan	✔	✔	100
North Sulawesi	✔	✔	100
Central Sulawesi	✔	✔	100
South Sulawesi	✔	✔	100
Southeast Sulawesi	✔	✔	100
West Sulawesi	✔	✔	100
West Nusa Tenggara	✔	✔	100
East Nusa Tenggara	✔	✔	100
Maluku	✔	✔	100
North Maluku	✔	✔	100
Gorontalo	✔	✔	100
Papua	✔	✔	100
West Papua	✔	✔	100

Source: Analysis Result, 2021

In 2021, all regions received the Special Physical Allocation (SAF) Fund with the Thematic Assignment of Sustainable Economic Infrastructure (SEIP) Provision for the Small and Medium Industry Sector, except for areas in the Provinces of Bali and DKI Jakarta. The planning gap analysis of SAF with Thematic Assignment of SEIP for the Small and Medium Industry Sector involved 32 provinces where the analysis results showed that the Physical SAF menu for the SEIP for the Small and Medium Industry Sector was not suitable (0% suitability level) with regional priorities in four provinces, namely West Java Province, Bangka

Belitung, Central Java, and West Kalimantan. Other provinces had a suitability level of 100% or had included a menu of development and revitalization activities for the Small and Medium Industry centres in their planning documents. The provinces were Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, Lampung, Riau Islands, Banten, DIY, East Java, Central Kalimantan, South Kalimantan, East Kalimantan, North Kalimantan, North Sulawesi, Central Sulawesi, South Sulawesi, Southeast Sulawesi, West Sulawesi, West Nusa Tenggara, East Nusa Tenggara, Maluku, North Maluku, Gorontalo, Papua, and West Papua.

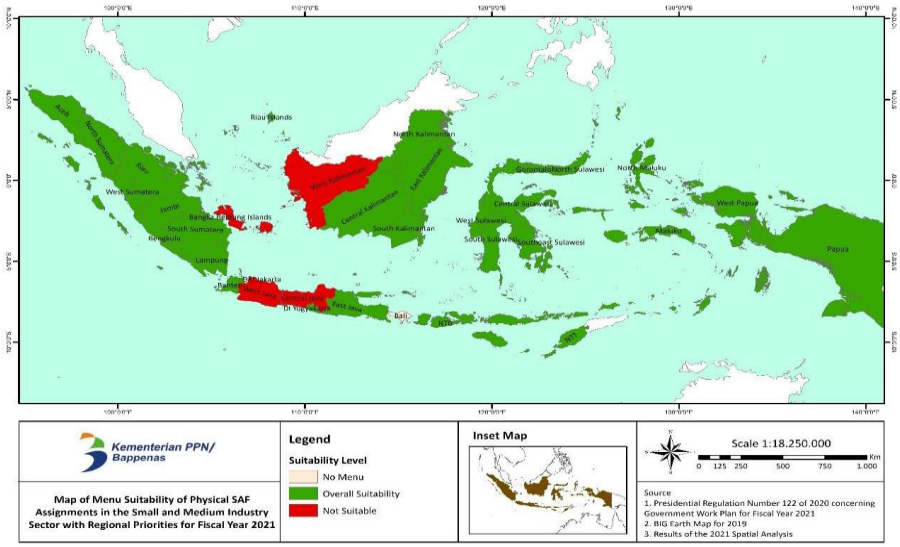


Figure 5. Map of Menu Suitability of Physical SAF Assignments in the Small and Medium Industry Sector with Regional Priorities for the Fiscal Year 2021 (Source: Analysis Result, 2021)

Based on the analysis of the regional suitability for the activity menu of the Physical SAF Assignment of SEIP focusing on the Small and Medium Industry sector, 87% had overall suitability while 13% were not suitable. Thus, it can be assumed that 87% of the regions had included the menus of development and revitalization activities for Small and Medium Industry centres in their regional planning documents (the PGWP of 2021). In each activity menu, 88% of the Small and Medium Industry (SMI) Center Development and SMI Center Revitalization SAF Physical Assignment activity menu followed the regional priorities listed in the planning documents, especially the Provincial Government Work Plan (PGWP) of 2021.

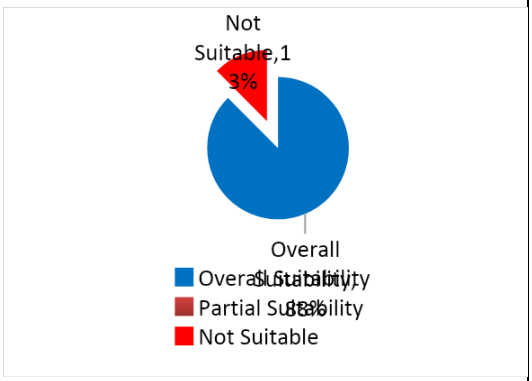
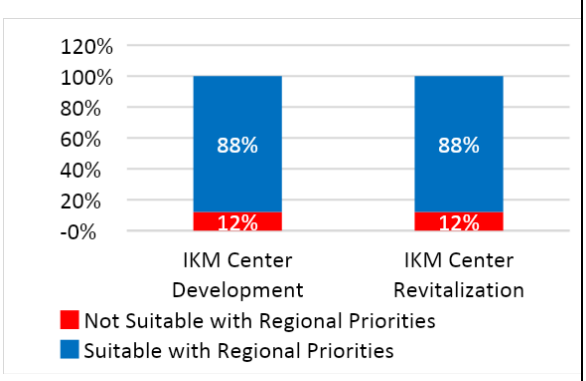


Figure 6. The Proportion of Regional Suitability with Physical SAF Assignments for Small and Medium Industry Sector for the Fiscal Year 2021 (Source: Analysis Result, 2021)



Note: IKM Center means Small and Medium Industry Center

Figure 7. Levels of SAF Suitability Menu with Regional Priorities in Physical SAF Assignments for the Small and Medium Industry Sector for the Fiscal Year 2021 (Source: Analysis Result, 2021)

3.3 Internalization of SAF Policy in Roads Development Planning

The Special Allocation Fund for the Road Sector Assignment had two activity menus: Road Handling and Bridge Handling. The locations prioritized for the Physical SAF Assignment of the Road Sector with Thematic of Sustainable Economic Infrastructure Provision (SEIP) were National Tourism Areas, Special Economic Zones (SEZ), and Industrial Estates. National Tourism Areas were directed at locations as mandated in Government Regulation No. 50 of 2011 concerning the National Tourism Development Master Plan of 2010-2025, where there were 88 National Tourism Strategic Areas. The target locations for Special Economic Zones (SEZ) were directed as regulated in Presidential Regulation No. 3 of 2016 concerning Special Economic Zones of 11 SEZs and Presidential Regulation No. 45 of 2016 concerning Government Work Plans for the 2016 Financial Year, which included 10 SEZs. The target locations for Industrial Estates were directed based on the Ministerial Regulation that regulates industries, including the Small and Medium Industries. The development policy of the Small and Medium Industries for the period of 2020-2024 is required to further spread industrial development outside Java Island with the primary strategy, namely building 30 Small and Medium Industry Centers to promote the growth of SMEs in the centres and create employment.

The Physical Special Allocation Fund of the SEIP Assignment in the Road Sector for the Fiscal Year 2021 was implemented in all regions except in DKI Jakarta, Banten, and West Java. In other words, the planning gap analysis on the implementation of Physical SAF of SEIP Assignment in the Road Sector for the Fiscal Year 2021 only included 31 provinces. The gap analysis results showed that, out of 31 provinces, one province with menu of activities for the Physical SAF Assignment of Roads did not follow its regional priorities in the Provincial Government Work Plan of 2021. The province was North Kalimantan.

Table 3: Menu of Suitability of the Physical SAF Assignments in the Roads Sector with Regional Priorities for the Fiscal Year 2021

Provinces	Menu of Suitability of Physical SAF Assignments in the Roads Sector with Regional Priorities		%
	Road Handling	Bridge Handling	
Aceh	✔	✔	100
North Sumatra	✔	✔	100
West Sumatra	✔	✔	100
Riau	✔	✔	100
Jambi	✔	✔	100
South Sumatra	✔	✔	100
Bengkulu	✔	✔	100
Lampung	✔	✔	100
Bangka Belitung	✔	X	50
Riau islands	✔	✔	100
Banten	✔	✔	100
West Java	✔	✔	100
Central Java	✔	✔	100
DIY	✔	✔	100
East Java	✔	✔	100
West Kalimantan	✔	✔	100
Central Kalimantan	✔	X	50
South Kalimantan	✔	✔	100
East Kalimantan	✔	✔	100
North Kalimantan	X	X	0
North Sulawesi	✔	X	50

Provinces	Menu of Suitability of Physical SAF Assignments in the Roads Sector with Regional Priorities		%
	Road Handling	Bridge Handling	
Central Sulawesi	✔	X	50
South Sulawesi	✔	✔	100
Southeast Sulawesi	✔	✔	100
West Sulawesi	✔	✔	100
West Nusa Tenggara	✔	✔	100
East Nusa Tenggara	✔	✔	100
Maluku	✔	✔	100
North Maluku	✔	✔	100
Gorontalo	✔	✔	100
Papua	✔	✔	100
West Papua	✔	✔	100

Source: Analysis Result, 2021

There were four provinces with a suitability level of 50% or only one menu of activities that followed their regional priorities. The provinces were the Bangka Belitung Islands, Central Kalimantan, North Sulawesi, and Central Sulawesi. Other provinces had a suitability level of 100%, or two menus of activities for the Physical SAF of SEIP Assignments in the Road Sector had followed their regional priorities. The provinces were Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, Lampung, Riau Islands, Central Java, DIY, East Java, West Kalimantan, South Kalimantan, East Kalimantan, South Sulawesi, Southeast Sulawesi, West Sulawesi, Bali, West Nusa Tenggara, East Nusa Tenggara, Maluku, North Maluku, Gorontalo, Papua, and West Papua.

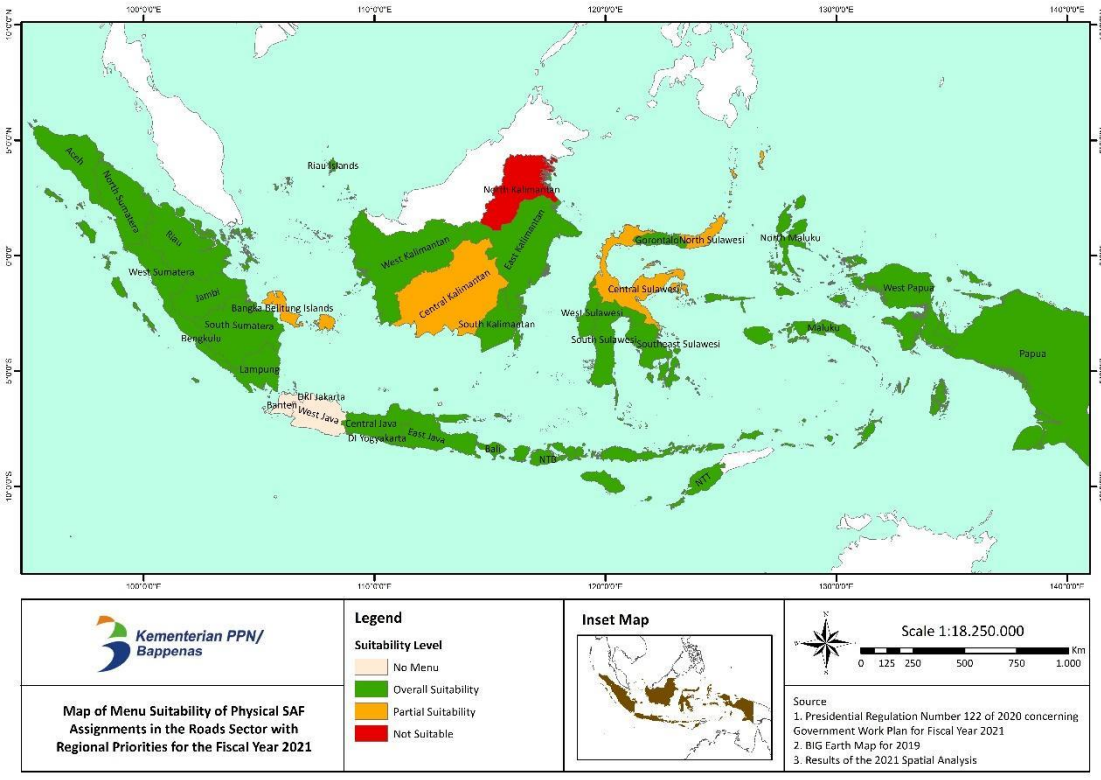


Figure 8. Map of Suitability Menu of Physical SAF Assignments in the Roads Sector with Regional Priorities for the Fiscal Year 2021 (Source: Analysis Result, 2021)

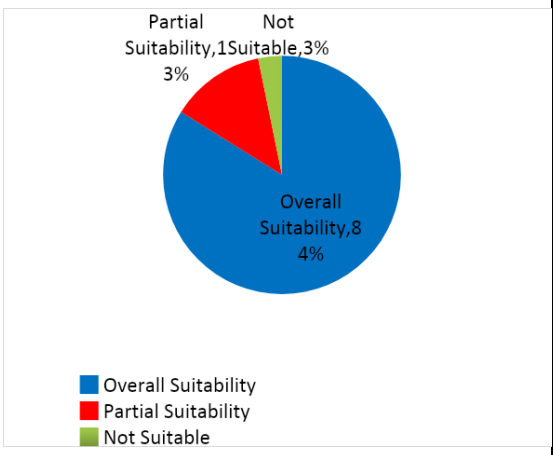


Figure 9. The Proportion of Regional Suitability with Physical SAF Assignments for Roads Sector for the Fiscal Year 2021 (Source: Analysis Result, 2021)

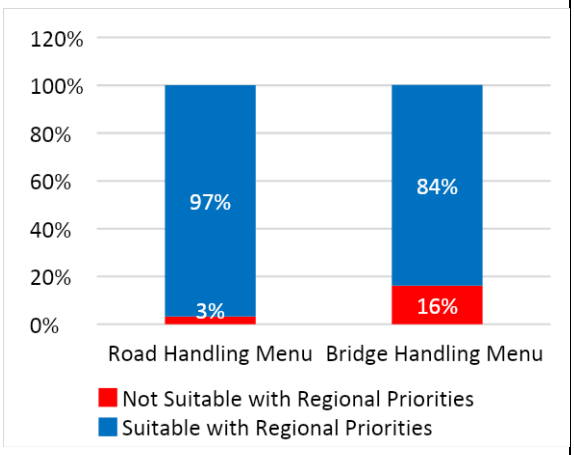


Figure 10. Level of SAF Menu Suitability with Regional Priorities in Physical SAF Assignments for the Roads Sector for the Fiscal Year 2021 (Source: Analysis Result, 2021)

Based on the results of the analysis, the regional suitability for the Physical Special Allocation Fund of SEIP Assignment in the Road Sector for the Fiscal Year 2021 had three categories: 1) provinces with overall suitability to the SAF menu (84%), 2) partial suitability (13%), and 3) not suitable with the Physical SAF menu (3%). Although there was a discrepancy between the SAF menu and regional priorities, most of the Physical SAF menus of SEIP Thematic Assignment in the Road Sector for the Fiscal Year 2021 followed their regional priorities, especially in the regions that had received SAF budget allocations. This gap analysis also identified the suitability level of each menu of the Physical SAF for the Thematic Assignment of Roads. On the road handling menu, the suitability level of the menu with regional priorities was 97%. In comparison, the suitability level for the bridge handling menu was 84%. It showed that the regions prioritized the road handling menu in the Provincial Government Work Plan of 2021 more than the bridge handling menu.

3.4 Internalization of SAF Policy in Environment Sub-sector Development Planning

The Physical Special Allocation Fund for the Thematic Assignment of the Sustainable Economic Infrastructure Provision (SEIP) in the Environmental Sector only had one activity menu, namely waste management and supporting infrastructure. The criteria for a location of the Physical SAF Assignment in the Environment Sector were as follows: 1) It was a regency/city that had compiled and determined the Regional Policies and Strategies for the Management of Household Waste and Waste Similar to Household Waste (Jakstrada) and a Waste Management Balance (with the Regional Head's approval); 2) It was a regency/city included as a priority tourist destination area; 3) It was a regency/city with exemplary commitment and progress in waste management, but the percentage of operational capacity for waste management was still low; 4) The 2021 PON Papua venue based on the Instruction of the President of the Republic of Indonesia No. 1 of 2020 concerning Acceleration of Support for the Implementation of the XX National Sports Week and the XVI National Paralympic Week of 2020 in Papua Province.

Table 4: Menu of Suitability of Physical SAF Assignments in the Environment Sub-sector with Regional Priorities for the Fiscal Year 2021

Provinces	Menu of Suitability of Physical SAF Assignments in the Environment Sub-sector with Regional Priorities	%
	Waste Management and Supporting Infrastructure	
North Sumatra	X	0
Bangka Belitung	✔	100
West Java	✔	100
Central Java	✔	100
North Sulawesi	✔	100
Southeast Sulawesi	X	0
West Nusa Tenggara	X	0
East Nusa Tenggara	X	0

Source: Analysis Result, 2021

The Physical Special Allocation Fund (SAF) for the Sustainable Economic Infrastructure Provision (SEIP) with Thematic Assignment in the Environment Sub-sector for the Fiscal Year 2021 was only allocated to regions in eight provinces, including Bangka Belitung, Central Java, East Java, North Sulawesi, North Sumatra, Southeast Sulawesi, West Nusa Tenggara, and East Nusa Tenggara. Based on the planning gap analysis results in the eight provinces, four provinces with regional priorities followed the Physical SAF menu and four other provinces whose regional priorities did not follow the Physical SAF menu. The four provinces with regional priorities relevant to the menu were Bangka Belitung, Central Java, East Java, and North Sulawesi. Meanwhile, the four provinces that did not have environmental priorities were North Sumatra, Southeast Sulawesi, West Nusa Tenggara, and East Nusa Tenggara.

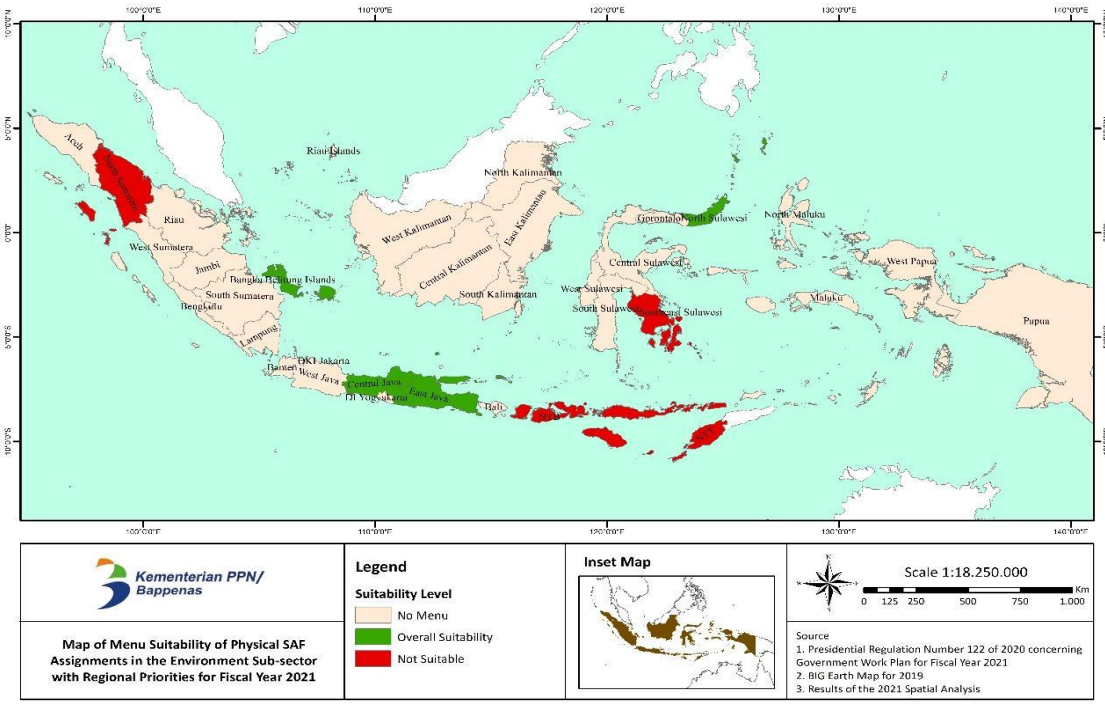


Figure 11. Map of Menu of Suitability of Physical SAF Assignments in the Environment Sub-sector with Regional Priorities for the Fiscal Year 2021 (Source: Analysis Result, 2021)

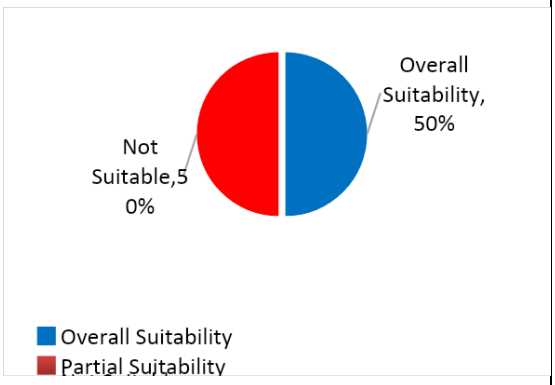


Figure 12. The Proportion of Regional Suitability with Physical SAF Assignments for Environment Sub-sector for the Fiscal Year 2021 (Source: Analysis Result, 2021)

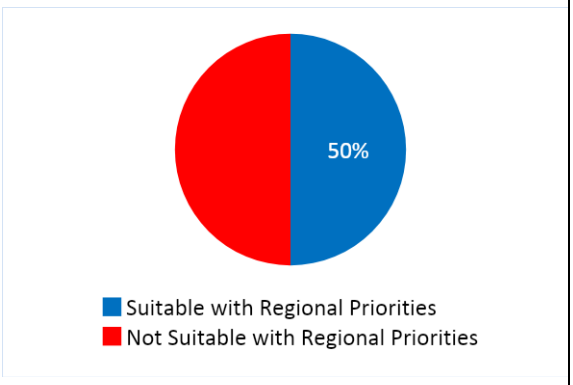


Figure 13. Levels of SAF Suitability Menu with Regional Priorities in Physical SAF Assignments for the Environment Sub-sector for the Fiscal Year 2021 (Source: Analysis Result, 2021)

The Thematic Physical SAF for the Provision of Sustainable Economic Infrastructure stated in Presidential Regulation No. 122 of 2020 consists of four fields: Small and Medium Industries, Tourism, Roads, and the Environment. Thematic Provision of Sustainable Economic Infrastructure is in line with one of the government's goals to achieve the National Economic Recovery (PEN) during and after the COVID-19 pandemic. The four fields in the Thematic Physical SAF for the Provision of Sustainable Economic Infrastructure were directed at the locus relevant to the implementation of the Major Project (MP) in the second National Priority (NP), namely developing areas to reduce inequality and ensure equity, and other National Priorities with a regional approach.

The policy direction of the Physical SAF in the Tourism Sector was to increase community economic activity, support the acceleration of economic recovery affected by the COVID-19 pandemic, and increase the competitiveness of tourism destinations. The direction of the Physical SAF in the SMI Sector was to encourage the development of industrial areas in 27 Industrial Estates spread across Indonesia and to support economic recovery in the regions to mitigate the impacts of COVID-19. The Physical SAF Assignments in the Road Sector had a specific policy direction aiming at improving the quality of transportation services through the reinforcement of connectivity, accessibility, and community mobility in national priority areas integrated into the national transportation network system to support poverty reduction and food security programs, as well as the provision of sustainable economic infrastructure as a response to the impacts of COVID-19. The Physical SAF Assignments for the Environment and Forestry Sector, the Environment sub-sector also supported the program aiming to provide sustainable economic infrastructure, especially in the development of 10 priority tourist destinations to support economic recovery after the COVID-19 pandemic. The four fields were integral to the infrastructure strengthening to support economic recovery after the COVID-19 pandemic.

3.5 Problems and Evaluation of Development Planning

Special Allocation Funds (SAF) have a significant role in regional development, which makes these funds one of the critical budget sources for physical infrastructure in regions with a high contribution. The role of SAF was illustrated from the aspect of regional planning. This planning gap analysis showed how SAF policies were internalized in regional development. The study was carried out within the provincial scope that received the Physical SAF allocation. The thematic assignments consisted of the Tourism Sector (20 provinces), Small and Medium Industry Sector (32), Roads Sector (31), and Environment Sub-sector (8). In the analysis of the suitability level between the planning of the Physical SAF Assignment of SEIP for the Fiscal Year 2021 in the Tourism Sector, out of 20 provinces, two provinces with no regional priority programs relevant to the Physical SAF menu for the SEIP Assignment of Tourism Sector were West Kalimantan and West Papua. A total of 15 provinces had regional development priority programs in their planning documents with 100% relevance to the activity menu of Physical SAF Assignments of SEIP in the

Tourism Sector. From 20 provinces, the diversity of the suitability levels of the menu to the priority of the provincial areas comprised 75% overall suitability, 15% partial suitability, and 10% unsuitability.

In the analysis of the suitability level between the planning of the Physical SAF Assignment of SEIP for the Fiscal Year 2021 in the Small and Medium Industry (SMI) Sector, the results showed that the Physical SAF menu for the SEIP in the SMI Sector was not suitable (0% suitability level) with regional priorities in four provinces, namely West Java Province, Bangka Belitung Islands, Central Java, and West Kalimantan. In terms of regional suitability for the activity menu of the Physical SAF Assignment of SEIP for the Small and Medium Industry sector, 87% had overall suitability, and 13% were unsuitable. In each activity menu, 88% of the Small and Medium Industry (SMI) Center Development and SMI Center Revitalization of SAF Physical Assignment activity menu followed the regional priorities listed in the planning document.

After analyzing the suitability level between the planning of the Physical SAF Assignment of SEIP for the Fiscal Year 2021 in the Roads Sector, one out of 31 provinces with the menu of activities for Physical SAF Assignment for Roads did not follow their regional priorities in the Provincial Government Plan of 2021, namely North Kalimantan. In terms of regional suitability for the Physical Special Allocation Fund of SEIP Assignment for Road Sector for the Fiscal Year 2021, there were three variations, namely provinces with overall suitability to the SAF menu (84%), partial suitability (13%), and unsuitability to the Physical SAF (3%). Although there was a discrepancy between the SAF menu and regional priorities, most of the Physical SAF menus of SEIP Thematic Assignment for Road Sector for the Fiscal Year 2021 followed regional priorities, especially in regions that received SAF budget allocations.

In the analysis of the suitability level between the planning of the Physical SAF Assignment of SEIP for the Fiscal Year 2021 in the Environment Sub-sector, the Special Allocation Fund was only provided to the regions in eight provinces, including Bangka Belitung, Central Java, East Java, North Sulawesi, North Sumatra, Southeast Sulawesi, West Nusa Tenggara, and East Nusa Tenggara. There were four provinces with regional priorities following the Physical SAF menu, and there were four provinces with regional priorities not following the Physical SAF menu. The proportion of regions with development priorities that were overall suitable with the SAF menu for the Thematic Assignment of SEIP in the Environment sub-sector was only 50%, and those that were not overall suitable accounted for 50%.

The data analysis results related to the suitability level of development planning for Physical SAF with the Thematic Assignment of Sustainable Economic Infrastructure Provision for the Fiscal Year 2021 showed that there are still some irrelevant Physical SAF policies to regional priorities, both for the themes of Tourism, Roads, Small and Medium Industries and the Environment Sub-sector. It indicates that the process of internalizing central-regional policies in the development planning system has not run optimally yet. Coordination of regional development planning related to SAF faced problems triggered by several conditions, such as 1) Implementation of different main tasks and functions from development planners in coordinated work units; 2) The procedures and working mechanisms of each work unit were different in carrying out development planning; 3) The organizational structure was less institutionalized according to the line of command; 4) Division of labour and leadership in coordinating development planning. Therefore, in the future, both the central and local governments need to consider creating an integrated regional development planning coordination model to realize the success of national development.

The coordination of SAF development planning in the regions has not run optimally yet, both from vertical and horizontal coordination (Pambudi & Pramujo, 2022; Handoko et al., 2017). Vertically, the most common problem is the gap between the main tasks, procedures, mechanisms, and organizational structure, which often provokes a debate in the matter of regional development planning. In addition, the problem of coordination is not well planned on a macro basis and is non-transparent, with procedures/mechanisms not following the provisions of the administrator. Likewise, in the case of data and statistical information that are not well-coordinated as part of the main tasks and functions, that must be procedural. Meanwhile, horizontally, the lack of clarity, inconsistency, and misunderstanding of planning coordination is characterized by unclear lines of command that often lead to differences in the division of tasks and weak leadership. In addition, the division of labour that changes frequently and the presentation of data/information depending on the characteristics of the leadership also leads to a less than optimal level of linkage to regional development planning.

Another problem in the implementation of national and regional development planning is the out-of-sync with budgeting. It can occur due to changes in organizational structure, coordination of central government transfer fund policies that have been adjusted due to certain conditions, low quantity and

quality of planning and budgeting staff, political interest factor, unalignment between the regional government strategic policies funded by the Local Government Budget and the targets and priorities of the transfer funds, and inadequate financial capacity of the region itself.

Conclusions

In a more general context, data analysis results related to the suitability level of development planning for the Thematic Assignment of Physical SAF of Sustainable Economic Infrastructure Provision for the Fiscal Year 2021 showed that there are some irrelevant Physical SAF policies to the regional priorities in the Tourism, Roads, Small and Medium Industries and the Environment Sub-sector. It suggests that the process of internalizing central-regional policies in the development planning system has not been optimal, both from vertical and horizontal coordination. From the vertical coordination of SAF, the most frequent problem is the gap between the main tasks, procedures, mechanisms, and organizational structure, which often becomes a matter of discussion in regional development planning. Meanwhile, horizontally, the lack of clarity, inconsistency, and misunderstanding of planning coordination is characterized by unclear lines of command that often lead to differences in the division of tasks and weak leadership. Another problem related to the implementation of national and regional development planning is the out-of-sync with budgeting. It can occur due to changes in organizational structure, coordination of central government transfer fund policies that have been adjusted due to certain conditions, low quantity and quality of planning and budgeting staff, political interest factor, regional government strategic policies funded by the Local Government Budget are not aligned with the targets and priorities of the transfer funds, and the inadequate financial capacity of the region itself.

Recommendation

Conceptually, the preparation of SAF proposals by the regions is a form of bottom-up participatory planning to avoid a mismatch between what is needed by the regions and what is provided by the central government, both in terms of type and amount of SAF. However, practically, the policy for Physical SAF for the Thematic Assignment of SEIP for the Fiscal Year 2021 had not been fully internalized in regional development planning as a regional priority program. A crucial recommendation to overcome this condition is that the verification process of the Physical SAF activity proposal from a region needs to consider its suitability with regional priorities. It is to ensure the sustainability of the central government intervention program, which the local government will continue. The Special Physical Allocation Fund is a temporary stimulus; thus, its themes and activities will adjust to national priorities.

T*he author recommends that the central and local governments involve all their devices related to the Physical SAF to carry out ex-ante evaluations from the development planning stage, both at the central and regional levels. The follow-up to this evaluation is the development of a comprehensive monitoring and evaluation system for the Physical SAF.* Good planning can consider the implementation logic, such as inconvenient terrain and adaptability to change. In addition, it is necessary to increase inter-agency coordination through communication channels, both at the central and regional levels, implementing more permanent regulations so that they are not easy to change and providing access to local governments to know the process of determining allocations. In the long term, it is essential to reorganize the central and regional planning timelines in a regulation to avoid asynchronous planning documents, including those funded by transfer funds, such as one in the form of the Special Allocation Fund.

References

Abbas, A. H. (2020). Model koordinasi perencanaan pembangunan daerah berbasis hukum di Provinsi Sulawesi Selatan. *Jurnal Amanna Gappa, 28* (1), 30–41. https://doi.org/10.20956/ag.v28i1.9840

Aziz, N. A., Supriyono, B., & Muluk, M. (2013). Analisis perencanaan pembangunan daerah dengan pendekatan sistem lunak: studi pada rencana kerja pembangunan daerah/RKPD Kota Malang. *E-Journal Fakultas Ilmu Administrasi Universitas Brawijaya*, 1–15.

Ervianto, W. (2019). Pengelolaan infrastruktur berdasarkan isu berkelanjutan di Indonesia. *SENADA (Seminar Nasional Manajemen, Desain dan Aplikasi Bisnis Teknologi)*, *2*, 574–581. https://eprosiding.idbbali.ac.id/index.php/senada/article/view/109

Fadlina, I. M., Supriyono, B., & Soeaidy, S. (2013). Perencanaan pembangunan pertanian berkelanjutan: kajian tentang pengembangan pertanian organik di Kota Batu. *Indonesian Journal of Environment and Sustainable Development, 4*(1), 43–57.

GoI. (2020a). [Presidential regulation 123 of 2020 concerning technical guidelines for physical special allocation funds for fiscal year 2021]. https://jdih.kemenparekraf.go.id/katalog-1052-produk-hukum

GoI. (2020b). [Presidential regulation 122 of 2020 concerning government work plan update 2021]. https://peraturan.bpk.go.id/Home/Details/157695/perpres-no-122-tahun-2020

GoI. (2004). [Law 25 of 2004 concerning national development planning system]. https://www.dpr.go.id/dokjdih/document/uu/26.pdf

Handoko, D., Mesran, Nasution, S.D., Yuhandri, & Nurdiyanto, H. (2017). Application of weight sum model (WSM) in determining special allocation funds recipients. *The IJICS: International Journal of Informatic and Computer Science, 1*(2), 31–35. http://doi.org/10.30865/ijics.v1i2.528

Harrison, J. (2020). Seeing like a business: Rethinking the role of business in regional development, planning, and governance. *Territory, Politics, Governance, 9* (4), 1–21. https://doi.org/10.1080/21622671.2020.1743201

Juanda, B. & Handa, H. (2017). Reformasi mekanisme dana alokasi khusus (DAK) untuk mendorong pertumbuhan dan pemerataan pembangunan di Indonesia. *Seri Kertas Kerja Nomor 2.*

Khoshnava, S. M., Rostami, R., Zin, R. M., Kamyab, H., Abd Majid, M. Z., Yousefpour, A., & Mardani, A. (2019). Green efforts to link the economy and infrastructure strategies in the context of sustainable development. *Energy, 193*(1), 69–75. https://doi.org/10.1016/j.energy.2019.116759

Nazarudin, T. (2015). Perencanaan kota secara komprehensif berbasis hukum integratif menuju pembangunan kota berkelanjutan. *Jurnal Cita Hukum, 3*(2), 213–224. https://doi.org/10.15408/jch.v2i2.2315

Pambudi, A. S. (2020a). Analysis of the relationship between human development index toward environmental quality index in South Sulawesi. *MONAS Jurnal Inovasi Aparatur, 2*(1), 109–123. https://doi.org/10.54849/monas.v2i1.14

Pambudi, A. S. (2020b). Evaluasi kesesuaian RKP dan RKPD 34 provinsi terkait dak fisik penugasan bidang lingkungan hidup dan kehutanan 2019. *Bappenas Working Papers*, *3*(1), 88–100. https://doi.org/10.47266/bwp.v3i1.58

Pambudi, A. S., Agnelia, D. P., & Putri, D. M. A. C. (2022). Evaluation of contribution and distribution of special allocation fund (DAK) physical assignment thematic of sustainable economic infrastructure provision. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*, *6*(1), 135–154. https://doi.org/10.36574/jpp.v6i1.250

Pambudi, A. S., & Pramujo, B. (2022). Peran dana transfer khusus bagi pembangunan bidang irigasi pascabencana Provinsi Sulawesi Tengah. *Jurnal Kebijakan Pemerintahan, 5*(1), 20–28. https://doi.org/10.33701/jkp.v5i1.2250

Pambudi, A. S., & Putri, D.M.A.C. (2022). Evaluasi dukungan DAK fisik bidang pariwisata bagi pembangunan daerah: studi kasus nasional dan provinsi Jawa Timur). *Bappenas Working Papers, 5*(1), 31–47. https://doi.org/10.47266/bwp.v5i1.106

Pambudi, A.S., & Sitorus, R.P.S. (2021). Omnimbus law dan penyusunan rencana tata ruang: Konsepsi, pelaksanaan dan permasalahannya di Indonesia. *Jurnal Ilmiah Wahana Bhakti Praja*, *11*(2), 198–217. https://doi.org/10.33701/jiwbp.v11i2.2216

Setianingsih, B., Setyowati, E., & Siswidiyanto. (2015). Efektivitas sistem perencanaan pembangunan daerah/SIMRENDA. *Jurnal Administrasi Publik (JAP), 3*(11), 1930–1936.

Shadrina, N., & Putri, A. K. (2019). Analisis penyaluran DAK fisik reguler bidang pendidikan di pulau bangka tahun 2017-2018. *Jurnal Ekonomi dan Kebijakan Publik, 2*(2), 36-46.

Sukarna, F., Subekan, A., & Rengga, A. (2012). Evaluasi dana alokasi khusus (DAK) bidang pendidikan di Kabupaten Cilacap tahun 2003. *Jurnal Undip, 7*(2), 1-11.

Volkery, A., Swanson, D., Jacob, K., Bregha, F., & Pintér, L. (2006). Coordination, challenges, and innovations in 19 national sustainable development strategies. *World Development, 34*(12), 2047–2063. https://doi.org/10.1016/j.worlddev.2006.03.003

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 2 - AUGUST 2022

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Policy Paper

Impact Analysis of Strategic Policy of Natural Resources and Environment in the Indonesian Long-term Development Plan of 2005—2025

Arif Haryana

Ministry of National Development Planning/National Development Planning Agency, Jakarta, Indonesia

haryana@bappenas.go.id

ABSTRACT

The policy implementation under the Indonesian Long-term Development Plan (RPJPN) for the 2005-2025 period is currently in the final stage. It is thus necessary to evaluate the development and impacts of the strategic policy implementation in the area of Natural Resources and the Environment (NR&E). This paper attempted to evaluate the area of NR&E within the RPJPN of 2005—2025. It focused on identifying people's perceptions about the impacts of the strategic policy implementation in NR&E. The data were collected through a survey targeting all regions of Indonesia and analysed using the importance-Performance Analysis (IPA) method. The results of the analysis showed that strategic policy implementation in NR&E was rated as having a fairly good impact. It was indicated by an average aggregate impact indicator score of 3.61 on a Likert scale of 1—5. With regard to the impacts on the aspects of development, the strategic policies of NR&E had a relatively high impact on economic growth, food security, and energy security. However, the impacts on job creation and reduction of poverty were relatively lower. There is an indication that strategic policies in NR&E tend to be biased as they favour capital owners.

Keywords: Impact Evaluation; Natural Resources and Environment; Policy Evaluation of Indonesia; Importance-Performance Analysis

ARTICLE INFO

Received: April 21, 2022
Received in revised form: August 5, 2022
Accepted: August 12, 2022
doi: 10.46456/jisdep.v3i2.300

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail:
journal.pusbindiklatren@bappenas.go.id

Supported by Indonesian Development Planners Association (PPPI)

1. Introduction

The Indonesian Long-term Development Plan of 2005—2025 (RPJPN of 2005—2025) covers nine areas of development, including the area of Natural Resources and Environment (NR&E) (Rencana Pembangunan Jangka Panjang Nasional Tahun 2005-2025, 2007). Natural resources play an important role in Indonesia's development as a base for economic growth and a source of foreign exchange and development capital. Natural resources are still the main source of economic growth in many regions of Indonesia, especially in provinces with rich natural resources.

Despite the significant role of natural resources as an engine of development, their high utilisation has been affecting environmental conditions. Cases of environmental damage in Indonesia have increased due to the high frequency of the use of natural resources. The records of Badan Nasional Penanggulangan Bencana (BNPB, n.d.)[1] showed that natural disasters in Indonesia increased significantly from 928 cases in 2008 to 5.402 cases in 2021, including floods, landslides, and forest and land fires. The advancement of transportation and industrialisation that is still dominated by the use of fossil energy with little clean technology application has resulted in water pollution and air pollution that substantially damages the environment. Environmental damages due to deforestation and land use conversion also occur in many other regions of Indonesia as they lower the quality of forests and land as life support systems.

Efforts to manage natural resources should be based on the principle of prudence for both renewable as well as non-renewable natural resources. Strategic policies regarding the utilisation of resources have become an important component in development planning, which allow the existing natural resources to be utilised in a sustainable way. NR&E should be maintained to avoid unnecessary degradation and depletion.

The implementation of strategic policies under the RPJPN of 2005-2025 is currently in the final stage. It is thus necessary to evaluate the development and impacts of these strategic policies within the area of Natural Resources and the Environment (NR&E). This paper provides an evaluation of the area of NR&E within the RPJPN of 2005-2025. It focused on assessing the impacts of the strategic policy implementation based on the perceptions of the Indonesian people, which are instrumental as the input for policy formulation in the next planning period.

2. Methodology

2.1 Framework

The framework of the evaluation was constructed based on Figure 1. Strategic policies in the Area of Development of NR&E contain five policy dimensions and policy indicators. The policy dimensions include (B1) Disaster Resilience and Climate Change, (B2) Food Availability and Consumption, (B3) Energy Sovereignty, (B4) Maritime and Marine Resources, and (B5) Environment and Forestry. There are several policy indicators in each policy dimension.

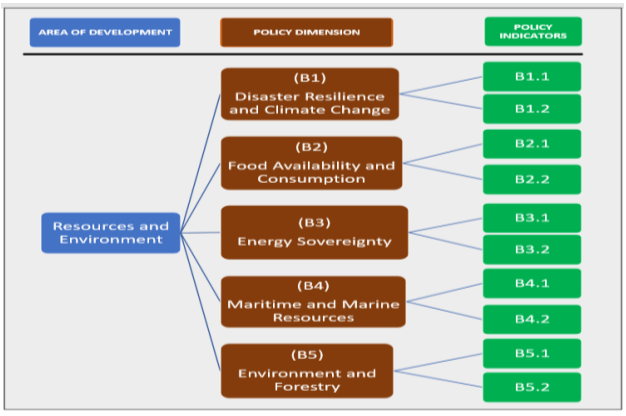


Figure 1. Policy Framework for Impact Evaluation

[1] Info Bencana (Monthly disaster information) published by BNPB (National Disaster Management Agency) since January 2013

2.2 Data

The data used in the analysis were the primary data collected from the survey. Questionnaires were employed to identify Indonesian people's perceptions about the degree of importance and performance of the strategic policy impacts on NR&E. Questionnaires were developed through several Focused Group of Discussions using the framework presented in Figure 1.

Perceptions about the degree of importance and impacts on various indicators were measured using the Likert Scale scores ranging from 1 to 5. The scoring criteria in measuring the degree of importance were as follows: 1= very unimportant, 2= not important, 3 = quite important, 4 = important, and 5 = very important, whereas the scores for the perceptions about the performance impacts were: 1= very low, 2= rather low, 3= quite high, 4= high, and 5=very high.

The survey was conducted in October 2021 in three regions: Western Indonesia, Central Indonesia, and Eastern Indonesia. There was a total of 164 respondents selected purposively. The criteria for the inclusion of respondents to the research were at least 35 years old and belonging to the productive age category at the beginning of the implementation period of the 2005-2025 RPJPN. These criteria were determined based on a consideration that the samples could experience and assess the impacts of the development during the 2005-2025 RPJPN period. All of the respondents had given complete responses to the questionnaires.

2.3 Measurement Technique

Measurement of the level of importance and the impacts of strategic policies are useful in the field of NR&E. Strategic policies were implemented based on the framework in Figure 1 and the scores obtained from the survey. The survey directly measured the score of each policy indicator. The measurement was then aggregated for every policy dimension and strategic policy of the area of development in NR&E.

The Policy Indicator Score is the average score given by all respondents. In addition, a policy dimension score is defined as the average score of all indicators in the dimension. At the aggregate level, the strategic policies of NR&E's scores are the average scores of the five policy dimensions.

2.4 Analysis Technique

The analysis mainly adopted quantitative descriptive methods, especially in assessing the level of impact of every policy dimension as well as its indicators. More specifically, the analysis was conducted by descriptively comparing the mean values of impact levels among policy dimensions and policy indicators.

Additionally, the Important-Performance Analysis (IPA) technique was utilised to place policy dimensions or the indicators in four quadrant areas, following the method developed by Martilla & James (1977) that was also applied by Ferreiraa (2015); Warner et al. (2016); and Zhao et al. (2021) in their research. The analysis discussion was focused on indicators with a high level of importance, providing an indication of priorities for policy preparation in the future.

3. Results and Discussions

3.1 Assessment of the Impacts of Strategic Policies by Dimensions

Overall, strategic policies in NR&E were rated as having a fairly good impact. This was indicated by an average aggregate impact indicator score of 3.61 on a Likert scale of 1-5 (Table 1). The score of each strategic policy dimension was also in a fairly good range. Strategic policies on the Dimension of Disaster Resilience and Climate Change were considered to have the highest impact with a score of 3.75, while the impact of the Forestry Environment dimension was the lowest with a score of 3.43.

Table 1: Impact Score by Dimensions of Strategic Policy

Strategic Policy Dimensions	Score*)
B1. Disaster Resilience and Climate Change	3.75
B2. Food Availability and Consumption	3.64
B3. Energy Sovereignty	3.60
B4. Maritime and Marine	3.65
B5. Environment and Forestry	3.43
Average Score	**3.61**

Source: Ministry of National Development Planning / Bappenas, 2021
(Impact Evaluation Survey of RPJPN Strategic Policy 2005—2025)

A high score in disaster resilience and climate change seems inseparable from the government's strategic policy position in handling it. In the Medium-Term Development Plan (RPJMN) of 2020-2024, the government placed disaster and climate resilience improvement programs as one of the national priorities in development. Strategic policies were perceived to be highly appropriate because Indonesia is in the category of countries with high levels of disaster risk. The level of exposure and vulnerability to disasters were quite high, especially disasters related to natural volcanic activity and hydrometeorology.

Over the past 10 years, incidents and intensity of natural disasters in Indonesia have tended to increase. Economic losses due to the effects of climate change were estimated to reach Rp115 trillion by 2024.[2] Consideration of these high risks had encouraged the Indonesian government to develop a nationally determined contribution roadmap as a commitment at the global level.

National priorities on climate change were made through three programs: improving environmental quality, disaster resilience and climate change, and low carbon development planning. To realise them requires a large amount of money. In an optimistic scenario, the total financing estimate is US$ 446.5 billion (34.6% of GDP for the period 2020-2024) or equivalent to US$ 21.9 billion per year. The need for funding is predicted to be greater because Indonesia plans to achieve Net Zero emissions by 2060 or sooner.[3]

3.2 Assessment of the Strategic Policy Impacts on Aspects of Development

Natural Resources and the Environment (NR&E) are important and strategic capitals that have an influence on various aspects of national development as a whole. There are eight strategic aspects of development in the RPJPN of 2005-2025, namely Food and Agricultural Security (Code C1 in the survey), Energy Security (C2), Disaster Resilience and Climate Change (C3), Environmental Quality and Forestry Management (C4), Economic Growth (C5), Equitable Development (C6), Poverty Reduction (C7), and Job Creation (C8).

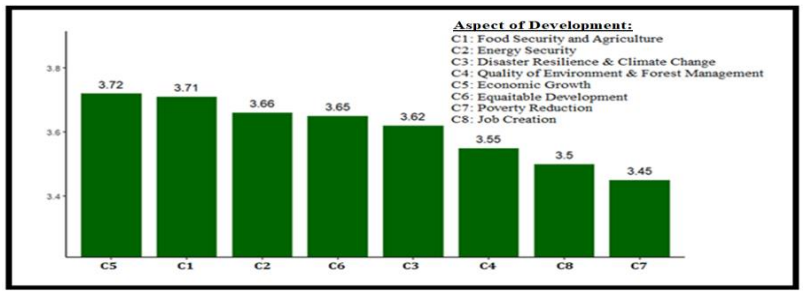


Figure 2. Impact Score of Strategic Policy in NR&E on Every aspect of Development

[2] Estimated by Bappenas (2021)

[3] Speaking at COP26, Minister of Energy and Mineral Resources, Republic of Indonesia Gives Indonesia's Commitment to Net Zero Emission. (PRESS RELEASE NUMBER: 389.Pers/04/SJI/2021 Date: 2 November 2021)

An assessment of the impacts of the strategic policy usefulness in NR&E in the 2005-2025 RPJPN on each aspect of development over the past 20 years (until 2021) is depicted in Figure 2. The strategic policies in NR&E were considered to have considerably good impacts on all aspects of development, with the lowest score of 3.45 and the highest score of 3.72. Figure 2 shows that such strategic policies have provided relatively large impacts/benefits on economic growth (C5), food security (C1), and energy security (C2). However, its impacts on job creation (C8) and reduction of poverty (C7) were relatively low.

The results of this assessment confirmed that Indonesia's economic growth is still dependent on natural resources. The high impact scores on economic growth and low scores on job creation and poverty reduction indicate a misalignment between economic growth and job creation as well as poverty alleviation. This fact implies that the strategic policies in NR&E tend to prefer investors/capital owners rather than the communities. This shows that the management of natural resources and the environment carried out by the government was perceived to be non-optimal by the public. Such misalignments will become strategic issues in the future that the government should be aware of and deal with. There have to be policies that provide wider access for the community in the management and utilisation of natural resources for the improvement of their welfare.

Strategic policies in NR&E have provided a significant contribution to the acceleration of economic growth, food security, and energy. However, there is an imbalanced trade-off between economic activities and the environment. Management and utilisation of natural resources in some areas have been conducted in an unsustainable manner, resulting in deforestation of natural forests, over-exploitation of coastal and marine resources, as well as the high conversion of agricultural lands.

Over-exploitation of the forest is still occurring until a recent period. Forest Watch Indonesia (FWI, 2021) showed that the area of natural forests in Indonesia continues to decline from year to year. In 2000, there were about 106 million hectares of natural forest in Indonesia. This number declined to 82 million hectares in 2017. Even though deforestation still occurs today, the rate of deforestation has been significantly decreasing (Kementerian Lingkungan Hidup dan Kehutanan [KLHK], 2021).

Mulyani et al. (2016) conducted land conversion research in nine central rice-producing provinces using Landsat imageries and Google Earth's IKONOS, Quickbird-2, and Worldview with 8 to 12 years differences. The research found that the national conversion rate is estimated at 96,512 ha per year. The conversion rate is alarming. Without significant measures to safeguard the existing paddy fields and develop new paddy fields, Indonesian food security will be at risk.

The use of environmentally-friendly energy is also still a serious challenge in developing natural resources and the environment in some regions, partially due to a lack of human resources capability and access to technology. In the future, the government needs to implement natural resources management policies based on the ecosystem approach to prevent the occurrence of non-optimal management practices.

3.3 Assessment of the Strategic Policies Impacts by Region

The impacts of the strategic policies on NR&E during the RPJPN of 2005-2025 in all regions were deemed fairly good with scores between 3 and 4. There were no significant differences between the impacts perceived by the respondents in western and central Indonesia, with rating scores of 3.62 and 3.61, respectively. However, the respondents in the Eastern Region of Indonesia rated the impacts of the strategic policies of NR&E with a lower score of 3.37. (Figure 3)

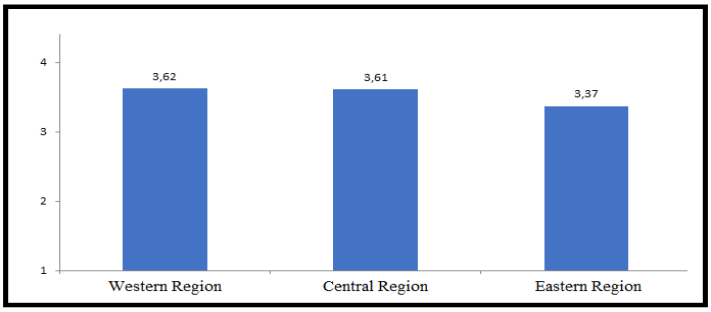


Figure 3. Assessment of Impact Policy Performance by Region of Indonesia

It is suspected that there are some unsolved problems related to the use of natural resources and the environment in the eastern part of Indonesia. It seems that the utilisation of abundant natural resources has provided little benefit to residents, mainly due to limited access. The attempts to utilise natural resources are still constrained by the problems of poverty, infrastructure development, isolation, and unemployment. Connectivity factors that are still low, especially in eastern Indonesia, become obstacles that hinder people from managing and utilising natural resources optimally. The development of adequate infrastructure and increased accessibility of people in eastern Indonesia are urgent and strategic.

3.4 Importance-Performance Analysis of Strategic Policy in NR&E

Evaluation of strategic policies in NR&E in RPJPN of 2020-2025 is essential as reference material in policy formulation for the next planning period. Not only is it important to evaluate the benefits of policies, but it is also necessary to evaluate the importance level of various dimensions of the policy and its indicators. Integrating analysis of the impact performance and the importance level of the policy dimensions and their indicators will provide information about the position of policy dimensions/indicators in four quadrant categories: Quadrant I (Top-Right): Important–High Performance, Quadrant II (Bottom-Right): Not Important–High Performance, Quadrant III (Bottom-Left): Not Important – Low Performance, and Quadrant IV (Top-Left): Important–Low Performance. Mapping the position of policy dimensions/indicators becomes an important reference in formulating upcoming policies.

a. Importance Performance Analysis (IPA) on the Policy Dimensions

There are five policy dimensions in the strategic policies of NR&E in RPJPN 2005-2025 (Figure 4). All the five Policy Dimensions were rated as important to very important (with scores ranging from 4 to 5), although the Energy Security Dimension (code B3) received the lowest rating. On the impact performance side, the assessments of the five dimensions discovered more variation in performance levels, with scores ranging from 3.43 to 4.75.

Disaster and Climate Resilience (B1) and Food Availability and Consumption (B2) are two policy dimensions considered highly important. Both dimensions of the policies also have high impact performance; hence, the two policy dimensions need to be included in the future development period. Meanwhile, although the dimensions of Environment and Forestry are also considered very important, it has relatively low impact performance (Figure 4). Some policy improvements are needed to enhance a more positive impact.

The survey results showed that the public has high awareness that the country is facing a high level of disaster insecurity. The public pays a considerably large attention to the policy dimensions related to disasters and climate change. The policy dimensions of disaster resilience and climate change are related to data, information, and facilities for rapid response in disaster management, as well as mitigation and adaptation efforts to minimise the impacts of climate change by lowering greenhouse gases.

The increasing threat of climate change in the future should be a collective concern of the government and communities. Measures to reduce greenhouse gas (GHG) emissions through the establishment of national targets for GHG reduction (National Determine Contribution) in various fields need to be continued. Similarly, mitigation efforts, especially against potential natural disasters, have to be reinforced by the Indonesian government through relevant ministries and institutions to minimise the negative impacts of disasters.

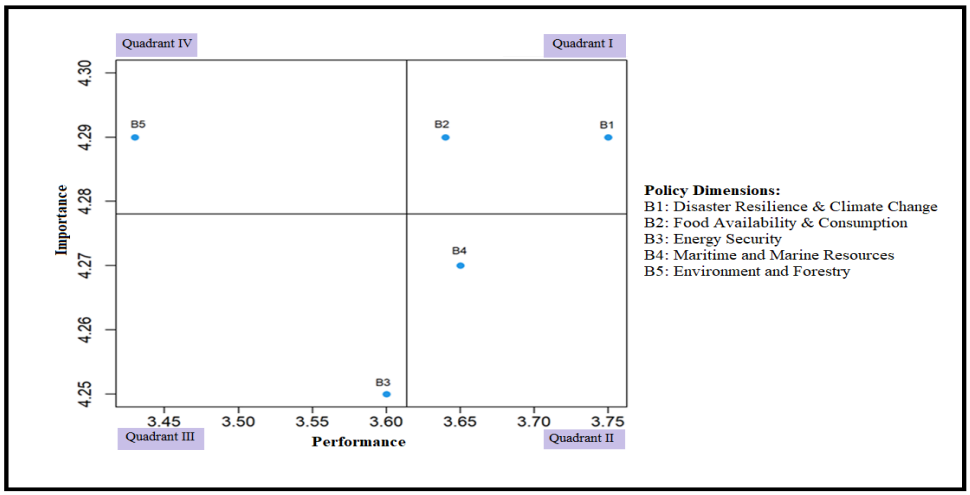


Figure 4. Importance Performance Analysis (IPA) Dimensions of NR&E

The policy dimensions of food availability and consumption are considered crucial because food security is a basic need of the community. It is one of the main obligations of the government to ensure the availability of food as a basic need. In this regard, the government has implemented various policies and programs, both in the upstream (on-farm) and downstream (off-farm) sectors supported by various technologies and improvements in food systems and governance. The community also perceived that the implemented policies during the RPJPN of 2005-2025 are successful and highly beneficial.

In the future, the issue of food security will remain an important and strategic issue; thus, it should remain a development priority. The potential threat of climate change to food and the increasingly limited availability of agricultural resources make food security issues more important. In addition, food consumption patterns and responsible food consumption will become more relevant concerns in the future. Policies and efforts to improve the quality of people's food consumption should be improved. It is also necessary to promote the paradigm of responsible consumption to reduce food waste.

Increasing domestic food production capacity will become a more strategic measure for the national interest. Indonesia should not be dependent on food supply from the international market because it is very small compared to that of global production. The world's food markets are highly fragile and undependable because they are vulnerable to changes in global geostrategy. The disruption of the world's food supplies as a result of the Ukraine-Russia war accentuates the need for attempts to increase domestic food production.

b. Importance Performance Analysis (IPA) on Natural Resources Policy Indicators

All indicators of NR&E in RPJPN 2005-2025 were mapped to four quadrants based on the respondents' perceptions about the level of importance and usefulness of each strategic policy (Figure 5). The analysis was conducted mainly on indicators considered to have a high level of importance, namely those in Quadrant I and Quadrant IV.

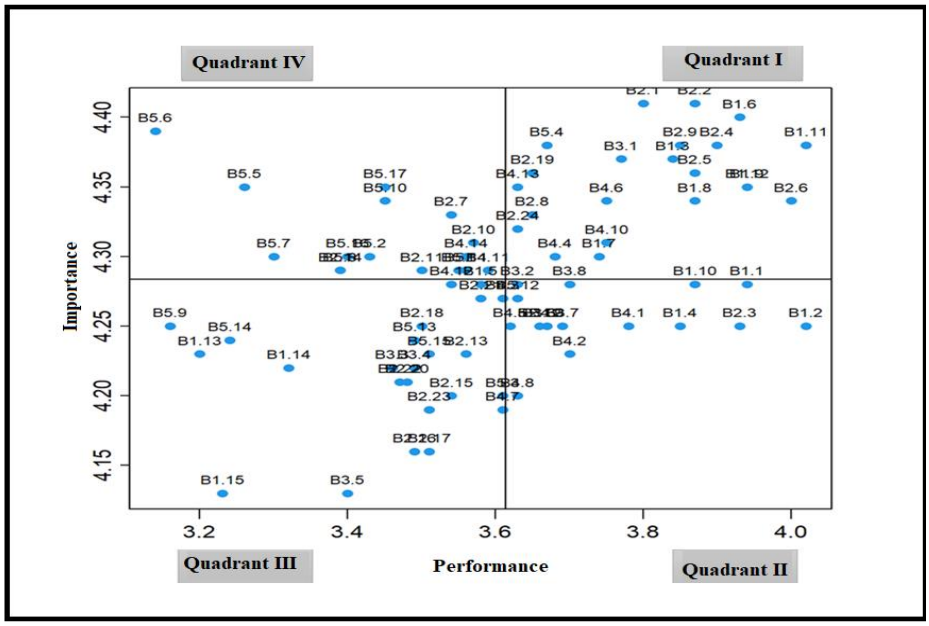


Figure 5. Importance Performance Analysis (IPA) Mapping of Policy Indicators of NR&E

Quadrant I (Top-Right) contains indicators considered important and have a relatively high impact on performance. Considering their level of importance, policies and program intervention related to this indicator needs to be safeguarded in the future. The performance of their use should also be maintained. Quadrant IV (Top-Left) includes indicators considered important but with poor usefulness performance. Because it is considered important, policies related to this indicator require serious attention to improve their usefulness performance in the future. Table 2 lists indicators for both Quadrant I and Quadrant IV for the five dimensions of strategic policies.

Table 2: Performance Rating of Important Indicators per Dimension of Strategic Policy in NR&E

Strategic Policy Dimensions	Indicators with Good Performance (Quadrant I)	Indicators with Poor Performance (Quadrant IV)
B1. Disaster Resilience and Climate Change	B1.3 Availability of data and information related to disaster-prone areas of earthquakes, volcanoes, floods, landslides, ground movements, and others that are always updated (update) regularly B1.6 Rapid responses in search and rescue during disasters, both at the national and regional levels B1.7 Availability of facilities to support rapid responses and relief to disasters B1.8 Fast-response coordination flow in disaster search and rescue B1.9 The responses of the officers to the reporting of disaster incidents (example: BNPB / BPBD response from community reports) B1.11 Availability/existence of disaster management agencies regionally and nationally (e.g. BNPB /	--

Strategic Policy Dimensions	Indicators with Good Performance (Quadrant I)	Indicators with Poor Performance (Quadrant IV)
	BPBD, BASARNAS, PMI, Fire Service, and others) B1.12 Performance of disaster management agencies at the national and regional levels	
B2. Food Availability and Consumption	B2.1 Availability of food and agricultural products in fulfilling the needs of the community B2.2 Availability of food and agricultural products in traditional markets B2.4 Ease of access to food and agricultural products B2.5 Access to food and agricultural products for the rural communities B2.6 Access to food and agricultural products for the urban communities B2.8 Quality of consumption and food safety B2.9 Certification of food products (e.g., halal certification, BPOM, organic, and others). B2.19 Availability of water sources to support agricultural irrigation B2.24 Support of national and local governments to achieve food security	B2.7 Fulfillment of food production targets from the agricultural sector B2.10 The level of public knowledge of safe and quality food products B2.11 Socialization and education from the government about safe and quality food products to the community B2.14 Access to fertiliser
B3. Energy Sovereignty	B3.1 Ease of access to energy and electricity (e.g. strong power generation capacity and equitable electricity infrastructure throughout the region)	--
B4. Maritime and Marine Resources	B4.4 Availability of storage facilities for caught products at the port (e.g. cool storage, ice cube factory, and others) B4.6 Productivity of marine and fisheries sectors B4.10 The handling of illegal fishing (e.g. illegal, unreported, unregulated fishing) in Indonesian territorial waters B4.13 Determination and management of aquatic conservation areas in national parks	B4.11 Rehabilitation of mangrove ecosystems, coral reefs, seagrass meadows, lagoons, and management of coastal areas B4.14 Local government support in the conservation and structuring of coastal areas
B5. Environment and Forestry	B5.4 Utilisation of environmental services from forest areas (natural tourism, water/hydrological protection, erosion/flood control, carbon absorption, storage, etc.)	B5.1 Sustainability of natural resource utilisation B5.11 Availability of data on regions/regions with the potential for land and forest fires (hot spots) that are always updated (updated) periodically) B5.10 Land and forest fire prevention efforts

Strategic Policy Dimensions	Indicators with Good Performance (Quadrant I)	Indicators with Poor Performance (Quadrant IV)
		B5.17 Conservation and rehabilitation of natural habitats for flora and fauna
		B5.2 Sustainable use of timber forest products
		B5.16 Sustainability of biodiversity
		B5.8 Conservation and rehabilitation of watersheds
		B5.7 Integrated handling of waste from various sources (industrial, household, and commercial)
		B5.5 Environmental quality (water quality, land cover, and air)
		B5.6 Environmental quality from domestic waste pollution, liquid waste, as well as hazardous and toxic material waste

Considering the impact performance listed in Table 2, we can analyse every policy dimension as follows:

B1. Disaster Resilience and Climate Change. There were seven indicators that the public considers important in the policy dimension of Disaster Resilience and Climate Change. The performance of all the indicators was rated good by the public, and none of them had a poor performance rating. The high assessment of disaster management performance showed that the response to disaster management is getting faster and more effective.

The handling of the 2004 Tsunami disaster in Aceh, earthquakes in Yogyakarta (2006) and Sumatra Barat (2009), and the Tsunami in Sulawesi Tengah (2018) were implemented quickly. The quick responses had been supported by the more accurate and faster spreading of the early warning information on earthquake events and tsunamis. After learning the severity level of the Tsunami disaster in Aceh, Indonesia's BMKG (Meteorology, Climatology and Geophysics Agency) successfully developed Indonesia's Tsunami Early Warning System (Ina-TEWS). Ina-TEWS is now able to disseminate information about earthquakes and warnings of Tsunami potentials in less than five minutes.

Good performance of disaster resilience was also supported by institutional reformation. The establishment of BNPB in 2008 as a policy manifestation to strengthen institutional setup had increased the effectiveness of inter-agency coordination with a clear handling mechanism.

B2. Food Availability and Consumption. People consider that production, availability, and ease of access to food are essential. They seemed satisfied with the availability and ease of access to food, even though the performance of food production was rated not very well. Indonesia is relatively capable of maintaining food security. The availability of food in the market is adequate, and this does not cause the price to increase dramatically. However, some food commodities still depend on imports from other countries. Food trade open policies have made it possible for food imports to fill the gap between domestic food production and consumption. Indonesia still imports various food commodities, including meat, dairy products, wheat, soybeans, and sugar in significant quantities.

The poor rating in the performance of food production was confirmed by the fact that Indonesia still imports some food commodities in large amount. The low rating seemed to correlate with the low rating in the ease of access to fertiliser, which is an important input in food production. In future development plans, the issue of increasing domestic food production must be prioritised to ensure food security and resilience, which is a highly strategic component of national security. With a huge population, Indonesia cannot rely on its food supply from the import markets, which are often disrupted by global geopolitical

changes. Current policies to develop food estate seem to be one of the strategic steps needed in achieving national food security.

B3. Energy Sovereignty. Among eight policy indicators for assessment under the policy dimension of Energy Sovereignty, the public considered only one pivotal indicator, namely the ease of access to energy and electricity. It seems obvious that access to energy, which includes availability and affordability, is considered strategic by the public. Energy policy should place this aspect in a high-priority category. The government will always strive to ensure the availability of energy at affordable prices. The survey results showed that, in the view of the community, policy interventions have been performing well and provide plenty of benefits.

Policy in the energy sector has had a positive impact on the public. An assessment of energy security carried out from 2004 to 2020 by DEN (National Energy Council) revealed that Indonesia's energy security value continues to increase from year to year. The assessment was based on four aspects, namely Availability, Affordability, Accessibility, and Acceptability. Analytical Hierarchy Process (AHP) was used as the weighting method. On average, the primary energy supply in 2020 in the last five yearsrew by 3.5% (Dewan Energi Nasional [DEN], 2021).

The fact that the public did not rate most policy indicators (including renewable energy) as important may generate more challenges in the future. The perception would cause the strategy implementation to develop new and renewable energy to become more challenging. Energy utilisation in Indonesia currently still heavily relies on fossil energy, including oil, LPG, and coal. The supplies of oil and LPG are becoming more dependent on imports. The government is required to create an optimal policy to accelerate the development of NR&E to reduce dependency on imported fossil energy. Indonesia's New and Renewable Energy potential is abundant. Thus, it is necessary to educate and increase the awareness of the public in this regard.

B4. Maritime and Marine Resources. The public considered that programs or interventions related to the economic aspect, especially in marine fisheries production and the determination and management of aquatic conservation, have been performing well and providing useful impact. The finding was consistent with research by Sapanli et al. (2020), concluding that the marine industry, fisheries, and marine tourism have the greatest leverage in economic development. The policy implications that must be carried out are to increase productivity in these sectors so that they can increase the values of technical coefficients and increase investment. In addition, the development of economic activities in these sectors must be supported by information technology required in the fourth industrial revolution.

Despite giving a good rating on the impact on the economic aspect, the public considered that the effectiveness of programs in marine ecosystem rehabilitation and coastal areas management were still lacking. The role of local government was also considered weak in this regard. Ecosystem and coastal rehabilitation and conservation issues will become more challenging issues in the future. Policy on the issues needs to be enhanced and strengthened.

B5. Environment and Forestry. Among eleven indicators that the public considered important in the policy dimension, only the performance of one indicator was rated good, namely the utilisation of environmental services from forest areas. The performance of the other important indicators was considered relatively poor. These include policy indicators related to the improvement of environmental management, mainly in the prevention of land and forest fires, conservation, rehabilitation and sustainable use of biodiversity, and environmental quality as life support systems. Widiatmaka (2009) presented the fact that the achievement points to some failures, with an example of a growing number of critical watersheds until 2008, which are the result of poor environmental management.

Despite presenting some poor environmental policy performance Widiatmaka (2009) said that policies, programs, and activities in the field of NR&E had been compiled completely and well. However, Hakim (2018) argued that failure and lack of optimal public policies are mostly caused by public policy formulations that are not systematic, partial, and have not touched the substance of the matter. Considering the high importance of the policy indicators for the public, those aspects have to be incorporated into the policy of the next planning period.

Conclusions

Strategic policies in NR&E were rated as having a fairly good impact on all aspects of Indonesia's development. From the regional perspective, there was no significant difference in the impacts of NR&E on the western and central regions of Indonesia. However, the impacts of NR&E policies on the eastern region were slightly lower than those on other regions.

With regard to the impacts on development aspects, the NR&E strategic policies were considered to have a relatively high impact on economic growth, food security, and energy security. The impacts on job creation and poverty reduction were relatively lower. There were indications that strategic policies in NR&E tended to favour capital owners.

Among the strategic NR&E policies, the dimensions of Disaster and Climate Resilience and Food Security were perceived to be highly significant with highly beneficial impacts. Thus, they need to be sustained. Meanwhile, the impacts of policies on the environmental and forestry dimensions were deemed insufficient.

Recommendations

Based on the results of the evaluation, we provided several policy recommendations as follows: (1). Develop a fair natural resource management policy, which provides wider access for the community to the management and utilisation of natural resources for the improvement of their welfare. (2). Strengthen policies related to important strategic indicators in strategic policy dimensions of disaster resilience and climate change, food security, and energy security, as well as several other strategic indicators. (3). Improve the national capacity of food production and accelerate the development of renewable energy. Reform policies related to important strategic indicators in strategic policy dimensions in the dimensions of Environment and Forestry, especially related to conservation and sustainability of natural resources and the environment.

References

Badan Nasional Penanggulangan Bencana. (n.d.). *Informasi kebencanaan bulanan teraktual*. Informasi Bencana. https://bnpb.go.id/informasi-bencana

Dewan Energi Nasional. (2021). *Laporan hasil analisis neraca energi nasional 2021*. https://www.den.go.id/index.php/publikasi/documentread?doc=buku-neraca-energi-2021.pdf

Ferreiraa, H. P., & Fernandes, P. O. (2015). Importance-performance analysis applied to a laboratory supplies and equipment company. *Procedia Computer Science*, *64*, 824–831. https://doi.org/10.1016/j.procs.2015.08.634

Forest Watch Indonesia. (2021). *The polemic of Indonesian deforestation*. https://fwi.or.id/en/the-polemic-of-indonesian-deforestation/

Hakim, A. L. (2018). Kajian kebijakan sumberdaya alam berbasis pada ekologi politik. *The Indonesian Journal of Public Administration (IJPA)*, *4*(2), 1–11. https://doi.org/10.52447/ijpa.v4i2.1290

Kementerian Lingkungan Hidup dan Kehutanan. (2021, March 4). *Laju deforestasi Indonesia turun 75,03%*. https://www.menlhk.go.id/site/single_post/3645/laju-deforestasi-indonesia-turun-75-03

Martilla, J. A., & James, J. C. (1977). Importance-performance analysis. *Journal of Marketing, 41*(1)*, 77-79*. https://doi.org/10.1177%2F002224297704100112

Mulyani, A., D. Kuncoro, D. Nursyamsi, & Agus, F. (2016). Analisis konversi lahan sawah: Penggunaan data spasial resolusi tinggi memperlihatkan laju konversi yang mengkhawatirkan. *Jurnal Tanah Dan Iklim*, *40*(2), 121–133. http://repository.pertanian.go.id/bitstream/handle/123456789/2384/Konversi%20Lahan%20Sawah%20Indonesia%20sebagai%20Ancaman%20terhadap%20Ketahanan%20Pangan.pdf?sequence=1

Rencana pembangunan jangka panjang nasional tahun 2005-2025. (2007) (testimony of Republik Indonesia). https://peraturan.bpk.go.id/Home/Details/39830/uu-no-17-tahun-2007

Sapanli, K., Kusumastanto, T., Budiharsono, S., & Sadelie, A. (2020). Dinamika dan kebijakan pengembangan ekonomi kelautan Indonesia. *Jurnal Kebijakan Sosial Ekonomi Kelautan Dan Perikanan*, *10*(2), 117. https://doi.org/10.15578/jksekp.v10i2.9248

Warner, L. A., Chaudhary, A. K., & Lamm, A. (2016). Using importance-performance analysis to guide extension needs assessment. *Journal of Extension*, *54*(6). https://tigerprints.clemson.edu/joe/vol54/iss6/21

Widiatmaka. (2009). *Makalah pembahasan evaluasi kebijakan nasional pengelolaan sumberdaya alam dan lingkungan hidup di daerah aliran sungai*. Lokakarya Nasional Rencana Pembangunan Jangka Menengah 2010-2014, Bogor. https://www.researchgate.net/publication/283014137_MAKALAH_PEMBAHASAN_EVALUASI_KEBIJAKAN_NASIONAL_PENGELOLAAN_SUMBERDAYA_ALAM_DAN_LINGKUNGAN_HIDUP_DI_DAERAH_ALIRAN_SUNGAI

Zhao, J., Peng, Z., Liu, L., Yu, Y., & Yu, Y. (2021). Evaluation on the internal public space quality in affordable housing based on multi-source data and IPA analysis. *Land*, *10*(10), Article 1000. https://doi.org/10.3390/land10101000

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 2 - August 2022

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Policy Paper

Improving Research Infrastructure in Indonesia through Public Private Partnership (PPP)

Suardi Kadang

National Research and Innovation Agency (BRIN), Indonesia

suardi.kadang@gmail.com

ABSTRACT

The government continues to boost infrastructure development through different financing schemes, such as Public Private Partnership (PPP). The private sector is encouraged to participate in infrastructure development under this strategy, indirectly reducing the government's burden. National Research and Innovation Agency (BRIN), formerly known as the Indonesian Institute of Sciences (LIPI), as a government organization engaged in research, has chosen the PPP scheme for the Management and Development of the National Research Vessel Fleet to strengthen the capacity of the research infrastructure. This paper was written as a descriptive qualitative investigation using the literature study approach and relevant policy/regulatory literature. Also explains the need for research infrastructure, in this case, research vessels in Indonesia and provides an overview of the revenue potential and risk analysis in PPP projects. The result of this paper also provides an overview of BRIN's PPP implementation process. It can address issues such as whether the PPP scheme for research infrastructure development is of the PPP character, where the process is purely business-managed, how risk sharing is carried out in the PPP and how BRIN implements PPPs.

Keywords: PPP; Infrastructure; Research; Development; Vessel

ARTICLE INFO

Received: February 24, 2022
Received in revised form: August 22, 2022
Accepted: August 30, 2022
doi: 10.46456/jisdep.v3i2.260

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail:
journal.pusbindiklatren@bappenas.go.id

Supported by Indonesian Development Planners Association (PPPI)

1. Introduction

Infrastructure development has been mandated in the 9 (nine) Nawacita programs of President Jokowi in the 2015-2019 period, further continued in the 2020-2024 period focusing on infrastructure development. The fulfilment of infrastructure is thus vital to ensure the progress and independence of the nation, thereby enhancing Indonesia's competitiveness worldwide. However, one notable question lies in how the government's budget capacity to actualize such a program. In addition, one of the major problems in terms of infrastructure development deals with financing. Bappenas (The National Development Planning Agency) reported in 2019 that Indonesia's total infrastructure investment needs between 2020 and 2024 amounted to IDR. 6,445 T.

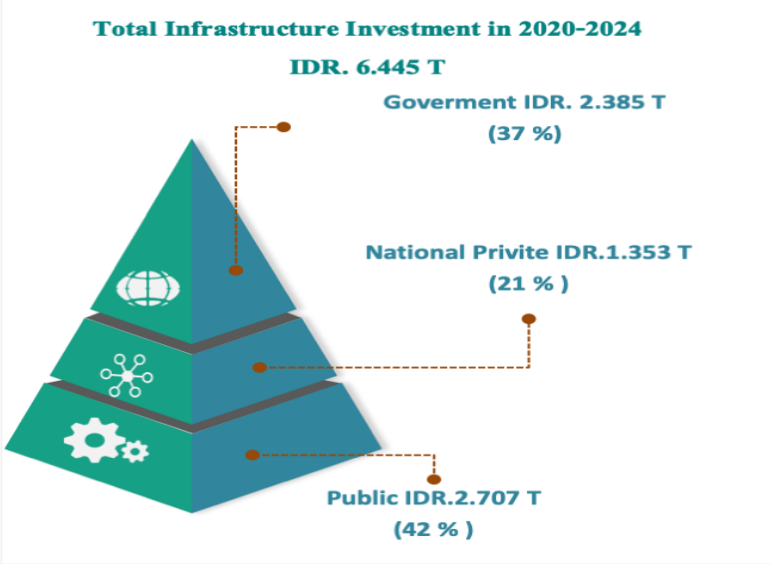


Figure 1. Infrastructure Investment of Indonesia in 2020-2024
Source: Bappenas (2019)

The infrastructure gap should be perceived as an opportunity for national growth, further explained in the 2020—2024 RPJMN document that an investment of IDR 35,212 trillion is required to achieve the annual target of average economic growth of 5.7—6.0 percent, or approximately IDR 4—35,455.6 trillion during the year 2020—2024. The government and SOEs are expected to contribute around 8.4—10.1 percent and 8.5—8.8 percent of the total needs, while the public or the private sector will fulfil the rest. Jin (2009) stated that the growing demand for PPPs in infrastructure financing was due to several factors, such as urbanization and lack of government funds.

PPPs have been internationally implemented as one of the alternative financing strategies in more than 85 countries to procure economic and social infrastructure projects (Regan et al., 2009). PPPs have developed promptly in recent decades to provide urban infrastructure and services in several countries (Doloi and Jin, 2007). Alternative financing through the Government Cooperation scheme with Business Entities in infrastructure development has been widely applied in several countries, including Indonesia. This scheme is perceived as much more efficient and effective because it involves the private sector in its implementation. Various problems that can arise include the debate of whether the PPP scheme for research infrastructure development is of PPP character, where the process is solely managed on a business basis, how the risk sharing is managed in PPP, and how BRIN (LIPI) implements the PPP. The activities conducted by BRIN provide a complete picture and recommendation to the Public Ministry and other institutions in implementing financing under the PPP scheme to develop research infrastructure.

Public Private Partnership (PPP), hereinafter referred to as PPP, refers to a collaboration between the government and business entities in providing infrastructure for the public interest by referring to the specifications previously determined by the Minister/head of institution/regional head/state-owned

enterprise/regional-owned enterprise that partially or exclusively utilize the resources from business entities with due observance of risk sharing between the parties (Republic of Indonesia, 2015).

It was further explained that PPP involved a collaboration between public and private sectors based on a long-term agreement to provide the services involving both private and public sectors and to maintain the infrastructure required for developing these services (Rudžianskaitė–Kvaraciejienė et al., 2015). PPP's core principle is to achieve the best value for the invested money based on the experience of the private sector and the sharing risk between the involved parties. PPPs have been implemented for various infrastructure projects worldwide. Further, the PPP approach will increase the economic value of the output generated by the established infrastructure (Zhang, 2005) and facilitate the overall infrastructure development (Li et al., 2016), such as the construction of transportation infrastructure, sports facilities, water conservancy facilities, waste disposal, and energy utilization. PPPs allow public and private sector investors to mutually work, based on contracts or institutional agreements, in designing, planning, financing, building, and operating infrastructure provided by the state (Cruz & Marques, 2013) as an alternative in building the country's infrastructure.

Table 1: Differences in Alternative Financing with Conventional Schemes and PPP Schemes Based on Presidential Decree Number 38/2015

NO.	CONVENTIONAL SCHEME	PPP SCHEME
1	Inconsistency from planning, construction design to maintenance	Continuity of implementation as outlined in the Long-Term Contract
2	Implementation delay	Minimal project implementation risks
3	Not assessing the risk aspect	Risk aspect study
4	The risk is borne by 100% of the government	Risk sharing
	Project funding according to the contract value	Possibility for other infrastructure

Source: Presidential Decree 38 of 2015

In the context of strategic research, PPP refers to a collaboration mode between publicly funded research organizations and service companies and is characterized by robust institutional collaboration over a long period to achieve complementary goals in mutually conducted research activities (Buckland, 2009). Likewise, the vessel research under the PPP project requires several other research institutions as stakeholders/users of vessel research services involving the private sector in investing in the management and construction of vessel research.

2. Methodology

This paper applies a descriptive qualitative study by utilizing the literature study method and policy/regulatory literature related to the observed problems. The author explains the need for research infrastructure, in this case, research vessels in Indonesia and provides an overview of the potential revenue and risk analysis in PPP projects. Further, the author conducted a more in-depth analysis of the PPP project run by the Indonesian Institute of Science, particularly the PPP scheme for the Management and Development of the National Research Vessel Fleet. In the end, it will produce recommendations related to alternative financing with the PPP scheme for developing research infrastructure in Indonesia that can be applied by other Ministries and Institutions that are engaged in research.

2.1 Data

BRIN (National Research and Innovation Agency) is one of the government research institutions generating numerous innovative products deemed reliable and beneficial to the community, inseparable from developing research infrastructure through various government funding schemes (APBN, PHLN,

PNBP, SBSN). To date, the fulfilment of research infrastructure through the PPP scheme in Indonesia has not been commonly conducted. Other ministries/institutions engaged in research have never used the PPP model to implement the funding scheme. Rakhel et al. (2021), using a bibliometric study, did not find articles/journals discussing the fulfilment of research infrastructure (Research and Development) through PPP schemes worldwide, including in Indonesia. They argued that infrastructure research n developing countries only took place in laboratories and hospitals. In contrast, research considering the management and development of research vessels was limited, indicating that the PPP scheme for fulfilling research facilities has been uncommon, despite the private sector's massive investment and government's commitment. Financing research vessels through the PPP scheme proposed by the Indonesian Institute of Science is deemed pivotal to supporting the development of marine research in Indonesia and worldwide.

Indonesia owns only 23 research vessels. The Indonesian government owns 18 research vessels of these vessels while private parties own the remaining five. The Joint Inter-Ministerial Team, coordinated by the Ministry of Communication and Informatics, reported that of the 18 research vessels owned by the government, only nine vessels were able to conduct surveys in deep sea waters, and the remaining three were only able to conduct surveys in shallow waters. Regarding function, only five research vessels have multi-purpose functions, while the remaining seven have special functions. Meanwhile, research vessels owned by the private sector have been dominantly devoted to conducting geological and mining surveys.

The demand for marine research vessel infrastructure is unavoidable. In 2019, based on a study from the Coordinating Ministry for Maritime Affairs, Indonesia had 15 ocean research vessels managed by several Ministries/Institutions with an average age of 26 years, thereby lacking technological aspects. Indonesian research vessels have been anchored at public ports or fishing ports such as KR Baruna Jaya I-IV . KR Baruna Jaya VIII docked at the Nizam Zachman Archipelago Fisheries Port in Muara Baru Jakarta along with other ships, including national fishing vessels. Likewise, the KR Geomarin III of the Ministry of Energy and Mineral Resources is anchored at the Container Port in Cirebon. These conditions are far from ideal due to several following factors, including:

a. High operational costs and standards
b. Vulnerability aspects of locations that are prone to fire, theft, and collisions.
c. Uncontrolled harbour pool depth
d. Provision of fuel and clean water supply
e. Unsupported warehousing, storage, and sample processing facilities.

2.2 PPP in Indonesia

PPPs are considered more effective in improving the quality of planning, spending, and maintaining public assets (Wulyono & Perwitasari, 2017). In addition, other factors that determine the success of infrastructure development in using the PPP scheme include a stable macroeconomic environment; shared responsibilities between the public and private sectors; a transparent and efficient procurement process; a stable political and social environment; and prudent government control (Chan et al., 2010). The factor of shared responsibility between the government and the private sector enables sustainability and guarantees the proper implementation of infrastructure development. According to the PPP issued by Bappenas in 2020, several PPP projects have been successfully implemented in Indonesia, illustrated in the following table:

Table 2: List of PPP Successfully Implemented Projects

NO	PROJECT NAME	GCA	INVESTMENT (USD)	CONCESSION PERIOD
1	Balikpapan – Samarinda Toll Road	BPJT	767.0 Million	40 years
2	Batang - Semarang Toll Road	BPJT	850.0 Million	45 years
3	Pandaan-Malang Toll Road	BPJT	461.0 Million	35 years

NO	PROJECT NAME	GCA	INVESTMENT (USD)	CONCESSION PERIOD
4	Jakarta – Cikampek II Elevated Toll Road	BPJT	1,249.0 Million	45 years
5	Manado-Bitung Toll Road	BPJT	396.0 Million	40 years
6	Cileunyi – Sumedang – Dawuan Toll Road	BPJT	617.9 Million	40 years
7	Serang – Panimbang Toll Road	BPJT	391.6 Million	40 years
8	Serpong-Balaraja Toll Road	BPJT	464.0 Million	40 years
9	Jakarta – Cikampek II South Toll Road	BPJT	1,718.8 Million	35 years
10	Krian-Legundi-Bunder-Manyar Toll Road	BPJT	940.0 Million	40 Years
11	Development Of Bandar Lampung Water Supply System	PDAM	82.6 Million	25 years
12	Development Of Umbulan Water Supply System	PDAM	140.7 Million	25 years
13	Development Of West Semarang Water Supply System	PDAM	28.97 Million	27 years
14	Nambo Regional Waste Management System	West Java Provincial Government	44.4 Million	25 years
15	Construction Of Palapa Ring West Package	Ministry of Communication and Information	87.6 Million	15 years
16	Construction Of Palapa Ring West Package	Ministry of Communication and Information	71.5 Million	15 years
17	Construction Of Palapa Ring East Package	Ministry of Communication and Information	386.5 Million	15 years
18	Central Java Power Plant	PT PLN	4,200 Million	25 years

Source: PPP Book 2020

The table indicates that the dominant infrastructure development involves the construction of dispersed toll roads in several cities in Indonesia and public facilities such as clean water, electricity and telecommunications. However, other ministries and institutions have not considered infrastructure in the field of research.

3. Results and Discussions

National Planning and Development Agency (2020) stated that the BRIN-PPP Project called "Construction of National Maritime Research Zone" has been included in the Under Preparation Projects. BRIN plans to build a National Research Vessel Fleet by implementing the Government Cooperation with Business Entity (PPP) mechanism as regulated in Presidential Regulation 38 of 2015 concerning PPPs in infrastructure provision. In Presidential Regulation No. 38/2015 Article 5 paragraph 2 point m, the National Vessel Fleet Management and Development project can be categorized as an educational

infrastructure facility. Further, Permen PPN 4/2015, Article 3, states that one of the education infrastructures is research and development facilities, which is a collaborated type of infrastructure.

In conducting the PPP project, BRIN is encouraged to create healthy competition and reduce market risk by conducting an open and competitive selection of business entities as stated in Institutional Regulation No. 29 of 2018 concerning Procedures for Procurement of Entities Implementing Business of Infrastructure Provision through Government Cooperation with Business Entities on the Initiative of the Minister/Head of Institution/Head of Region.

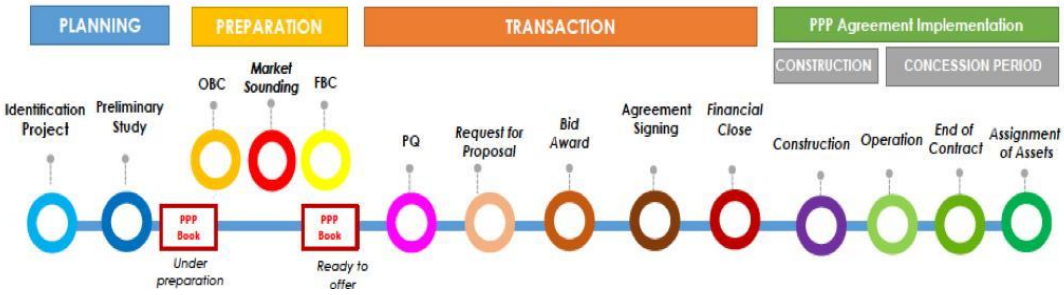


Figure 2. PPP Process

The aforementioned figure describes the PPP process in general, starting from planning, preparation, transactions, and infrastructure development, ending with the concession period and handover of assets by private parties.

The cooperation form of infrastructure for research facilities and supporting equipment is conducted with the following scheme:

- Baruna Jaya VIII Retrofit and Baruna Jaya IX Ships : Operate-Maintenance-Transfer

BJ VIII Research Ship to be Retrofit

BJ IX Research Ship Plan (Illustration)

The two illustrated types of ships above are research vessels owned by BRIN, applying another financing scheme, such as Foreign Loans from the World Bank. The Baruna Jaya VIII Vessel research will be rehabilitated/retrofitted thoroughly to maximize its function and usability. The research vessel of Baruna Jaya IX will be under construction in the next few years; thereby denoting that the PPP scheme for the two research vessels above is Operate-Maintenance-Transfer, comprising vessel research management and maintenance and handover to BRIN at the end of the concession period.

- Litoral Ship Procurement (0-200 m and 200-1000 m): Finance-Design-Build-Operate-Maintenance-Transfer

Litoral Ship 0-200 M (Illustration)

Litoral Ship 200 - 1000 M (Illustration)

The two illustrated ships are small littoral research vessels that will be used in coastal areas. The PPP scheme offered is Finance-Design-Build-Operate-Maintenance-Transfer. The private sector (BUP) will invest in building the two vessel types of research, carrying out ship design in accordance with needs, construction, research vessel, and maintenance and transferred to BRIN as Implementing Agency. This activity is expected to be accomplished in the third year after completing the PPP. Hence, in the first two years, BUP focuses on managing and maintaining research vessels through a financing scheme of Overseas Loan. By prioritizing the management of research vessels, BUP is expected to have experience in managing and maintaining research vessels, encouraging the readiness of new research vessels and BUP in all aspects**.**

Under a user tariff payment scheme with a payback period of up to 20 years, cooperation in the construction of a research vessel fleet is expected for:

a. Efficiency and effectiveness management. Management of marine research vessels will be more professional if carried out with PPP, considering that the Business entity will ensure the fulfilment of the agreed service standards for the certainty of investment returns;
b. Revenue management. Revenue management from marine research services will be more appropriate if a Business entity manages it with a PPP Scheme. Corporations must be able to manage income from business properly if there are limitations in operating income;
c. Service standards. Through the PPP scheme, the management of research vessels will improve service standards on timeliness and quality of infrastructure services, which are very crucial factors for business entities in ensuring the satisfaction of research vessel service users. This will increase operating income;
d. Risk management. Business entities have a stronger planning function when partnering with the government in calculating design risk, work delay risk, and funding risk. Through the PPP scheme, it is hoped that the government will obtain the most competent and selective Business Entities in managing these risks;
e. Research vessel management capability. The Business entity will ensure cost efficiency in the management of research vessels in the marine sector because it has taken into account its obligations to provide infrastructure services in accordance with the Minimum Service Standards agreed upon and supervised by the government to ensure the continuity of their investment returns during the cooperation period;
f. Transfer of knowledge. This collaboration is expected to result in knowledge transfer in the management of research vessels and their supporting facilities to be more efficient and effective in increasing the expertise of BRIN, which can provide benefits to stakeholders who use research vessel services for making decisions regarding the implementation of marine research programs in Indonesia.

Based on the aforementioned scope and responsibilities, the PPP project structure is as follows:

a. The implementing agency will enter into a PPP Agreement with BUP, and BUP in accordance with its responsibilities, will design, build, and maintain a fleet of ships and research facilities during the cooperation period. At the end of the cooperation year, the BUP will hand over all assets to the Implementing Agency;

b. BUP will enter into loan agreements with financing institutions, both national and or international, to finance the management of the Baruna Jaya VIII Retrofit and Baruna Jaya IX research vessels, as well as the procurement of Litoral Vessels (0-200 m and 200-1000 m); The loan amount will be made in stages according to the need for the provision, operation and maintenance of the research vessels.
c. BUP receives payments from users in the form of research vessel service transaction rates (based on sailing days), data acquisition services, and research data processing, whose schedules and rates are determined by the fleet department, according to the agreement contained in the PPP Agreement;
d. The Implementing agency will pay BUP in stages to ensure the return on investment. Through the user tariff mechanism, BUP will enter into a guarantee agreement with PT. PII (Indonesia Infrastructure Guarantee Agency Ltd.). Then, the implementing agency will also make a regress agreement with PT. PII.

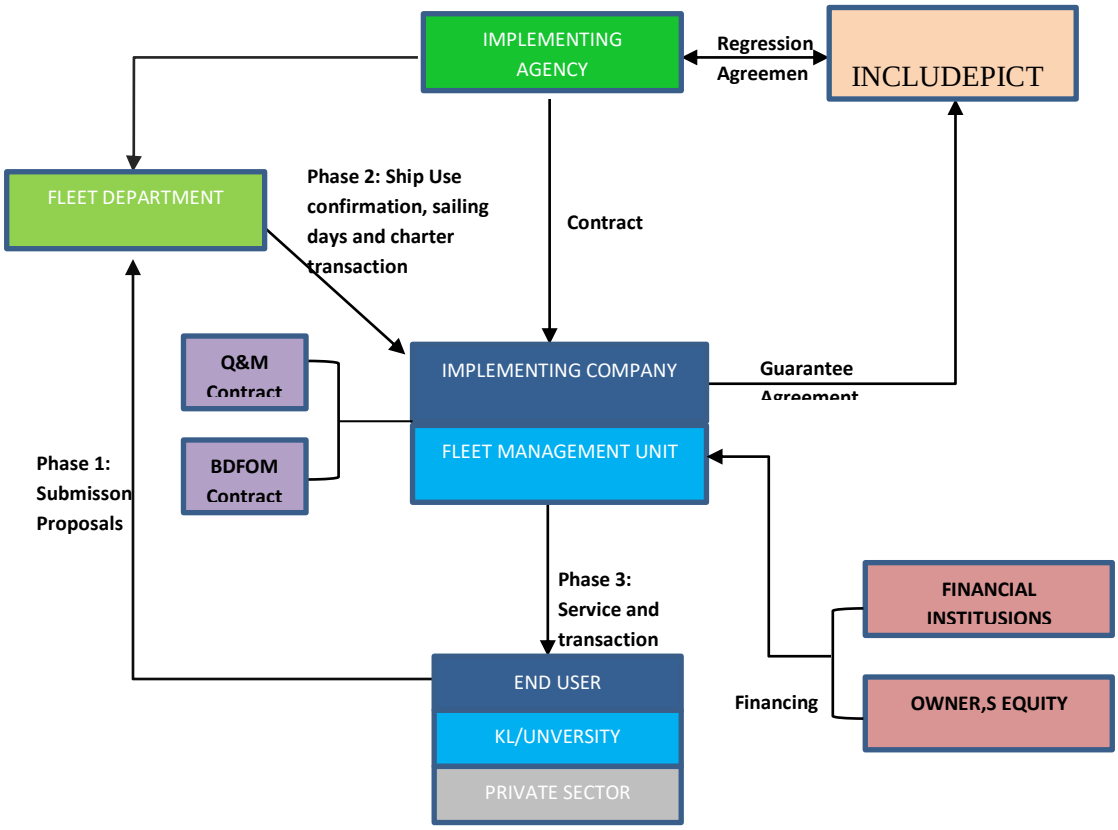


Figure 5. PPP Structure for the Management and Development of the National Vessel Fleet Research

Utilization of State Property (BMN) follows Government Regulation Number. 28 of 2020 concerning the Management of State/Regional Property. Research vessel fleet infrastructure in collaboration with the Implementing Business Entity (BUP) includes the management of the BJ VIII and BJ XI, in which the ship is BRIN asset managed by BUP. When utilizing the asset according to BUP, there is no need to provide PNBP to BRIN, because BUP is required to procure a minimum of 3 (three) Litoral vessels (2 vessels measuring 0-200 m and 1 vessel measuring 200-1000 m), starting from year 3. Meanwhile, during the cooperation period, all these assets will be the responsibility of BUP in their operation and maintenance. BRIN will enlist all assets under the responsibility of BUP, as contained in the Cooperation Agreement between the implementing agency and BUP.

At the end of the PPP agreement, BRIN will conduct an appraisal of all assets in the form of a research vessel fleet and its research equipment through an independent consultant. If, based on the appraisal results, all assets managed and maintained by the BUP are still functioning in accordance with the age provisions, all the assets will be handed over to BRIN and will be recorded as state assets.

Innovation in alternative financing for research infrastructure in Indonesia

Although numerous types of research by the government through conventional financing schemes such as using APBN and SBSN have been carried out, through these schemes, all aspects that may pose a risk of loss or discontinuity are relatively likely to occur because all forms of management and maintenance are borne to the relevant agency. This is in accordance with a study conducted by Kolinug et al. (2015) on administration assets, asserting that the state government in the local government in Tomohon City, North Sulawesi experienced insignificant effort from the asset sector in terms of collecting reports regarding maintenance activities by SKPD in Tomohon City.

Table 3: Budget by Source of Funds
The year 2017–2021

NO	SOURCE OF FUNDS	YEAR				
		2017	2018	2019	2020	2021
1	Pure Rupiah	976,808,622	1,093,891,606	1,089,268,213	844,942,242	955,106,719
2	Foreign Loans	84,894,966	94,835,000	111,250,000	120.050,000	109,750,592
3	PNBP	75,242,479	77,086,931	80,120,425	22,390,568	57,600,000
4	Overseas Grant	4,950,000	-	-	-	-
5	Domestic Direct Grants	560,000	-	-	100,000	-
6	Overseas Direct Grants	2,242,894	1,500,205	2,113,779	7,189,337	-
7	SBSN		120,000,000	240,000,000	508,702,101	866,989,184
	TOTAL	**1,144,698,961**	**1,387,313,742**	**1,522,752,417**	**1,503,374,248**	**1,989,446,495**

Source: https://spanint.kemenkeu.go.id/

The illustrated table presents the types of funding sources in the last five years conducted by BRIN, consisting of Pure Rupiah, Overseas Loans, several kinds of grants, and SBSN. SBSN funding sources have dominated research infrastructure spending, both physical laboratory construction and laboratory equipment to support research activities. Therefore, the PPP scheme is deemed novel for BRIN in developing research infrastructure expected to significantly impact the development of science and technology in Indonesia. In addition, this PPP project develops a blended financing pattern, such as vessel research managed at the beginning of the implementation period from the Foreign Loan financing scheme originated from France's state Agence Franaise de Development (AFD).

Apart from being an alternative to financing research infrastructure, this project provides numerous benefits to government and private stakeholders. The following are some of the identification benefits provided by the PPP project for the Management and Development of the National Vessel Fleet Research, including:

a. Community-Saving

1) In addition to providing benefits to the government, the existence and implementation of the BRIN PPP project will also positively impact society, including the business world in particular. Some of the identified benefits include:
2) The provision of data and information on marine research will facilitate the community and the business world related to the utilization of coastal and marine resources to optimize their business or new investments in the utilization of marine resources, both living and non-living.
3) The availability of data and information on biological resources such as fish stocks, especially in the WPP Indonesia area, including the deep sea, will increase the productivity of the community's capture fisheries to increase public income.
4) The availability of employment opportunities due to the realization of investment in the maritime sector for the fisheries and marine sector, transportation, mining, energy and environmental services such as tourism.

b. State Budget/Regional Budget and Regional Expenditures Saving

The obtained benefits for the government upon the implementation of PPP-KRKN project include direct and indirect benefits, such as:

i. Immediate Benefits

The immediate benefit is to sustain the state budget savings for implementing marine research, especially in the provision of research vessel operational funds or operation subsidies that the state has born.

1) Conducting research to explore marine resources, both living and non-living resources, in all Indonesian waters up to the EEZ area, which is included in the deep-sea category. Thus, the potential profile of marine resources can be more optimal and complete, especially for the deep sea, which has high economic value for the needs of food, medicine, and cosmetics.
2) Increasing state revenue through exploration fishery and marine biological and non-biological resources. Currently, the maritime sector contributes 20% to annual GDP; the maritime sector is expected to contribute 25-30% of GDP every year.
3) Accelerating the mapping of EEZ boundaries and the possibility of adding EEZ boundaries based on convention UNCLOS with its multifunctional marine research capabilities and wide coverage.

ii. Indirect Benefits

One of the indirect benefits is strengthening Indonesia's commitment to implementing the concept of managing its marine resource potential with the blue economy concept. The concept of the blue economy is Indonesia's commitment to several world forums to introduce a model for managing and utilizing Indonesian marine living and non-living resources with the sustainability principle to help save the earth's ecosystem, which is getting worse due to world economic exploration.

1) Encouraging the availability of reliable facilities and infrastructure in the field of marine research for the development of research and passion for marine research by the Government, Universities, the Business World, and related NGOs.
2). Providing data and information on potential water resources, including the deep sea, will stimulate increased investment interest in fisheries, marine affairs and the development of new and renewable energy.

3) Increasing the interest in investment and investment realization in fisheries, marine affairs, and new and renewable energy will open up job opportunities so that it will absorb the workforce of the Indonesian people and help reduce unemployment.

PPP revenue potential

The rewards obtained from PPP projects are deemed important for the private sector. Rewards refer to the results from building or investing in PPP projects. According to Iossa and Martimort (2015), giving rewards/benefits is pivotal to success in the PPP scheme. Likewise, Qizilbash's (2011) opinion that PPP is a collaboration between private and NGOs to develop new ways of producing and distributing services, sharing risk and rewards, where all parties (private and public) benefit from this transaction. In the PPP scheme, the income comes from the investment return provided by Implementing Agency /Government.

Return on investment to the private sector is thus crucial in PPP projects. After infrastructure or project development is implemented, all management and maintenance will be handed over to the private sector through the formed BUP. Therefore, the potential income that will maintain the return on investment must be identified earlier in accordance with the business as a good target market for the sustainability of the ongoing project. The potential revenue for this project comes from various sectors, which are described as follows:

a. Government Ministry

Ministries/public institutions in Indonesia that directly or indirectly have main tasks and functions in determining policies and utilization of maritime resource potential in Indonesia are the Ministry of Economics and Maritime, BAPPENAS, KKP, Kemenristek DIKTI, Kemenhub, MEMR ESDM, Ministry of Defense, KemenPAR and KLHK. Each Ministry has its main duties and responsibilities that directly or indirectly utilize the results of Marine Research. In 2020 the State Budget for these 9 Ministries was ± IDR 95.07 Trillion, and from this budget, there is an indication of potential activities related to marine research of Rp. 319Billion. Marine research activities in each Ministry are various according to their duties and functions. In the Ministry of Maritime Affairs and Fisheries (KKP), for example, most of the marine research is conducted related to fish stock surveys, marine service surveys, and ecosystem surveys in the context of marine spatial planning and to develop marine conservation areas.

b. Non-ministerial Institutions

Non-ministerial institutions in autonomous bodies/agencies or those under the Ministry are directly or indirectly related to maritime research and development in Indonesia. The non-ministerial institutions include BRIN, BMKG, BIG, and DISHIDROS AL. This institution has one of the main tasks of developing science and research in the maritime field or providing maritime data and information to support development activities in related fields or sectors. As an illustration, BRIN, a government research institution that takes a position and role in advancing science and technology in Indonesia to support the marine sector annually, receives a budget of approximately IDR 1 trillion. Approximately 60% of this budget is allocated for routine expenses, and the remaining 40% is implemented for research and scientific development activities.

c. National and International Universities/Research Institutions

Several universities or research institutes affiliated with universities in Indonesia are acknowledged for their marine research, such as the Bogor Agricultural Institute with its Faculty of Fisheries and Marine Sciences, the Bandung Institute of Technology, ITS, UNSRI, and UNHAS in Eastern Indonesia. In each of these universities, there are Units or Study Centers outside the Faculty in charge of Marine and Fishery Sciences conducting research in coastal and marine areas. These universities and research institutes generally have adequate marine research or survey equipment, but very few have research ships.

d. BUMN/National Private

State-owned or national private companies engaged in the maritime sector require adequate data and information from maritime research results in Indonesia. SOEs or Private Companies directly related to maritime research include the companies engaged in oil, mineral, and gas mining, especially those whose mining operations are along the coast and the sea. Several SOEs are engaged in oil, mineral, and gas mining, such as PERTAMINA, PGN, and ALUM. State-owned enterprises or other national private companies that require data and information support for marine research in carrying out their business operations are companies engaged in telecommunications, energy, and transportation. The installation of submarine pipelines or cables from BUMN urgently needs marine data and information so that the installed submarine pipelines or cables do not endanger shipping safety and disrupt or damage coastal and marine ecosystems. For example, the Singapore-Java-Pacific Echo Cable Route event requires marine research.

PPP Project Risk Analysis

The alternative for infrastructure funding that is pursued through the PPP scheme aims to share risks and responsibilities between the government and the private sector. The existence of the PPP scheme helps the government because the government is responsible for providing the infrastructure required for people's lives while the state budget has experienced limitations. On the other hand, the private sector can benefit from the PPP scheme because the projects carried out will generate revenue to replace the development costs provided by the private sector so that the private sector gains the confidence to get involved in collaborative projects with the government while the government provides infrastructure guarantees through PT PII . This guarantee aims to cover the risks that arise as a result of several conditions in the implementation of the PPP that cause these risks to be exposed.

Some countries also identify the risks arising from the ongoing PPP project. For example, the PPP project in Malaysia has struggled with several problems and challenges in aspects of project implementation, performance appraisal and monitoring. Three causes were identified as contributing factors that created the problems and challenges of the selected PPP model worldwide: human, technical, and financial factors. Among them, technical factors produce the highest and most complex issues (Hashim et al., 2017). Another study by Bing et al. (2005) identified the feasible risks in PPP projects in the United Kingdom and classified risks into three levels: macro level, meso level, and micro level. Further research by Palupi and Yuaniarto (2016) has identified the risk in infrastructure projects under the PPP scheme. The study pointed out the ten main risks that must be properly allocated, including: (1) financial and economic risk, (2) design and construction risk, (3) operational and maintenance risk, (4) political risk, (5) force majeure, (6) legal and policy risk, (7) income risk, (8) environmental risk, (9) project/contract failure risk, and (10) land acquisition risk. The risks allocated to the government include political risk, legal risk, and land acquisition risk. The private sector bears design and construction risk, operational and maintenance risk, and revenue risk. The risks that must be shared between the government and the private sector include financial risk, force majeure risk, and risk of project/contract failure. Another discovery was reported by Subramanian et al. (2012), who analyzed the political dimension of cooperation between partners. This study proposes risks and opportunities for a collaborative framework and identifies five general categories of risk perceived by decision-makers: capacity and knowledge, accountability and choice, sovereignty and autonomy, equity and access, stability and support.

Table 4: Allocation Risk for the Management and Development of the National Vessel Fleet Research

NO.	TYPE OF RISK	ALLOCATION RISK	
		GOVERNMENT	PUBLIC
1	Design, construction, and test operation risk		√
2	Sponsorship risk		√
3	Financial risk		√
4	Operation risk		√
5	Income risk	√	√
6	Network connectivity risk	√	
7	Interface risk	√	√
8	Political & policy risk	√	
9	The risk of force majeure	√	√
10	Ownership risk asset		√

Source: Pre Feasibility Study of Consultant (2020)

Conclusions

The development of research infrastructure, such as research vessels, aims to increase the participation of Indonesian researchers to produce research that can bring competitiveness with other countries. The limited government budget causes the need for research infrastructure to experience a slowdown. Therefore, BRIN initiates infrastructure development with the PPP scheme, the latest innovation. The PPP scheme has much better benefits and sustainability than the existing financing schemes. The innovation developed in this research vessel PPP project becomes the latest research infrastructure financing scheme within BRIN and Indonesia. To date, both BRIN and other research institutions in Indonesia have implemented the general state budget scheme to develop research infrastructure. In addition, the blending of finance in this project is expected to increase the interest and feasibility of the private sector project to participate in investing in this PPP project. Potential income on the project is thus derived from: government institutions, BUMN, the private sector, and universities both nationally and internationally engaged in marine resources. Risk analysis developed in the general business entity will manage the risk of financing, procurement, and maintenance of vessel research, by which the business entity will transfer some of the risks to other participants, such as design consultants and a company that manufactures ships and research equipment. The risk of operating marine research vessels and their supporting facilities becomes the risk of a business entity. The government also manages political and regulatory risks, including amendments to laws and regulations. Under certain conditions, such as force majeure, the government and business entities share the management risk by considering the ability of each party to handle the potential risks.

Recommendations

Based on the results of the analysis, several recommendations are made. First, the risk sharing between the government and the private sector is important because it will determine the success of PPP projects, not only the BRIN PPP projects but also projects in other government agencies that will implement a PPP financing scheme. Second, the commitment to the implementation process, starting from the planning process and transaction process to managing the infrastructure that has been built, takes a long time requiring mutual commitment from both parties at every stage. Third, the determination of the investment return scheme to the private sector must be studied more deeply to benefit both parties or to explore other investment return schemes because the innovation factor has been challenging in PPP projects. Finally, to determine the potential to gain for the private sector, mapping the financial capacity

of the Implementing Agency is also pivotal when using a return on investment scheme in the form of Availability of Payment.

References

Gayati, M. D. (2019). *LIPI: Indonesia akan kelola 12 kapal riset untuk eksplorasi kelautan*. Antaranews. https://www.antaranews.com/berita/1055346/lipi-indonesia-akan-kelola-12-kapal-riset-untuk-exploration-kelautan.

Bing, L., Akintoye, A., Edwards, P. J., & Hardcastle, C. (2005). The allocation of risk in PPP/PFI construction projects in The UK. *International Journal of Project Management*, *23*, 25 – 35. https://doi.org/10.1016/j.ijproman.2004.04.006

National Planning and Development Agency. (2020). [Public Private Partnership Book 2020].

Buckland, R. (2009). Private and public sector models for strategies in universities. *British Journal of Management*, *20*, 524–536. https://doi.org/10.1111/j.1467-8551.2008.00593.x

Chan, A. P. C., Lam, P. T. I., Chan, D. W. M., Cheung, E., & Ke, Y. (2010). Critical success factors for PPP in infrastructure developments: Chinese perspective. *Journal of Construction Engineering and Management*, *136*(5), 484–494. https://doi.org/10.1061/ASCECO.1943-7862.0000152

Cruz, C. O., & Marques, R. C. (2013). *Infrastructure public private partnerships: decisions, management and development*. Springer. https://link.springer.com/book/10.1007/978-3-642-36910-0

Doloi, H. & Jin, X. (2007). Risk management in public-private partnership (PPP) projects from the project management perspective. *Proceedings of Construction Management and Economics 25th Anniversary Conference – Past, Present and Future*.

Hashim, H., Che-Ani, A. I., & Ismail, K. (2017). Review of issues and challenges for public private partnership (PPP) project performance in Malaysia. *AIP Conference Proceedings*, *1891*(1). https://doi.org/10.1063/1.5005384

Iossa, E., & Martimort, D. (2015). The simple micro-economics of public-private partnerships. *Journal of Public Economic Theory*, *17*(1), 4–48. https://doi.org/10.1111/jpet.12114

Jin, X. (2009). Allocating risks in public-private partnerships using a transaction cost economics approach: A case study. *Construction Economics and Building*, *9*(1), 19–26.

Kolinug, M. S., Ventje, I., & Sherly, P. (2015). Analysis of fixed asset management at the Tomohon City regional financial and asset management revenue service. *Journal of Research in Economics*, *Management, Business, and Accounting*, *3*(1), 818–830.

Li, Y., Wang, X., & Wang, Y. (2016). Using bargaining game theory for risk allocation of public-private partnership projects: insights from different alternating offer sequences of participants. *Journal of Construction Engineering Management*, *143*(3), Article 04016102. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001249

Palupi, Y. M. R., & Yuniarto, H. A. (2016). Risk allocation of infrastructure projects with the government and business entity cooperation scheme (PPP): A literature review. *National Seminar on Industrial Engineering Universitas Gadjah Mada 2016*, 96–103.

Qizilbash, A. (2011). Public-private partnerships and the value of the process: the case of Sub-saharan Africa. *International Public Management Review*, *12*(2), 38–54.

Rakhel, T. M., Kusuma, P. T. W., & Suardi, K. (2021). Public-private partnership schemei research and development: A bibliometric study. *The Journal of Indonesia Sustainable Development Planning*, *2*(1), 31–44. https://doi.org/10.46456/jisdep.v2i1.109

Regan, M., Smith, J., & Love, P. (2009). *Public private partnerships: What does the future hold?* [Paper presentation]. The Construction and Building Research Conference (COBRA 2009) of the Royal Institution of Chartered Surveyors (RICS), London.

Republic of Indonesia. (2015). [Regulation of the president of the Republic of Indonesia number 38 of 2015 concerning government cooperation with business entities in the provision of infrastructure].

Rudžianskaitė–Kvaraciejienė, R., Apanavičienė, R., & Gelžinis, A. (2015). Modeling the effectiveness of PPP road infrastructure projects by applying random forests. *Journal of Civil Engineering and Management*, *21*(3), 290-299. https://doi.org/10.3846/13923730.2014.971129

Subramanian, A., Brown, B., & Wolf, A. (2012). Across the waters. Facing the risk of cooperation in international waters. *The World Bank Waterpaper*, 1–85.

Wulyono, R., & Perwitasari, S. W. (2017). *PPP efficiency in infrastructure provision: Fiscal risk information* (2nd ed.). (pp. 46–49).

Zhang, X. (2005). Critical success factors for public–private partnerships in infrastructure development. *Journal of Construction Engineering Management*, *131*(1), 3–14. https://doi.org/10.1061/(ASCE)0733-9364(2005)131:1(3).

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 2 - AUGUST 2022
E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Policy Paper

Does the Pandemic Affect Unemployment Rate in East Java? (A Study of Pre and Post COVID-19 Pandemic in 2016 to 2021)

Mochamad Kevin Romadhona

Faculty of Social and Political Science, Universitas Airlangga, Surabaya, Indonesia

mochamad.kevin.romadhona-2020@alumni.unair.ac.id

ABSTRACT

This paper aimed to identify the problems caused by labor policy in the 2016 – 2020 period in the province of East Java. This study can be a response to the employment problems being experienced by the people of East Java before and after the COVID-19 pandemic in Indonesia. Thus, it is necessary to conduct further studies to provide relevant recommendations regarding appropriate labor policies. The method used in this research was the descriptive method and analytical techniques using the unemployment rate, fully employed, and underemployed formulas. The results showed that the unemployment rate in East Java in the 2019-2020 period increased significantly by 1.92%. Meanwhile, the population working full-time decreased by 3.81%, whereas the population working part-time grew by 1.9%2. This can be due to the unavailability of sufficient employment opportunities for the working-age population in East Java as well as the government policies such as large-scale social restrictions, work from home, and termination of employment relationships by many companies.

Keywords: Labor Policy; Unemployment Rate; Fully Employed; Under Employed; Labor Matters

ARTICLE INFO

Received: June 30, 2022
Received in revised form: August 25, 2022
Accepted: August 31, 2022
doi: 10.46456/jisdep.v3i2.308

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail:
journal.pusbindiklatren@bappenas.go.id

Supported by Indonesian Development Planners Association (PPPI)

1. Introduction

In 2022, the unemployment rate in Indonesia as of February 2022 was 5.83%, which was lower by 0.43% than that of 2021 (Badan Pusat Statistik [BPS], 2022). In detail, 11.53 million people (5, 53%) of the working-age population were affected by COVID-19. A recent decline in the unemployment rate is certainly a tremendous success for the government and the wider community. Various policies have been made by the government to tackle and suppress the unemployment rate caused by the COVID-19 pandemic. One form of mitigation is the availability of labour market information with the support of the "karirhub" labour market information service that is integrated with the employment information system (Sisnaker) (Binalovotas, 2020). Meanwhile, based on the data published by the Office of Manpower and Transmigration of the East Java Province in 2021, there are at least 50,000 thousands of unemployed people in East Java (Dinas Komunikasi dan Informatika Jawa Timur, 2021).

The COVID-19 pandemic has significantly impacted various sectors, one of which is the industrial sector and the job market (Ruspendi, 2021).

In East Java, the proportion of unemployment in the last three years has fluctuated. In 2019, it was reported to reach 3.82%, which rose to 5.84% in 2021 (BPS Jawa Timur, 2021). According to Herniwati and Handayani (2019), unemployment is one of the most complex problems. As stated in Law No. 13 of 2003 which regulates employment, manpower is anything related to the workforce before, during, and after the work period ([Undang-undang Republik Indonesia tentang ketenagakerjaan], 2003). The unemployed refers to the group of people who do not work but are looking for job opportunities, preparing a new business, or having been accepted for work but have not started yet (Nasrullah, 2015). Unemployment is a macroeconomic problem that affects humans directly and is the most severe (Mankiw, 1997/2003).

The unemployment problem is caused by several factors, one of which is the wage level, which plays a very large role in labor conditions (Sholeh, 2007). It affects the demand and supply of labor (Nanga, 2005). A wage system is a policy and strategy to determine the compensation received by workers as remuneration or the result of their hard work (Mujanah, 2019). For workers, the problem of the wage system is a serious problem because it involves job sustainability and workers' welfare (Trimaya, 2014). Meanwhile, for companies, the wage issue is important because it can reach 80% (Jumena & Ikhsanti, 2015). An overly high wage will result in the cost of goods being too expensive to compete effectively in the market (Rahmawati, 2016). Meanwhile, according to the National Research Council, a wage is defined as a reward from an employer for work performed by the employees; it serves as a warranty for the continuity of a decent life and production (Zainal, 2006).

According to the data published by the Central Statistics Agency for East Java (BPS Jawa Timur, 2022), the number of unemployed people in the East Java Province in February 2022 was 23.04 million people, which was higher compared to the numbers in February 2021 and 2020, namely 22.97 and 23.1 million people, respectively. The open unemployment rate (TPT) in February 2022 reached 4.81%, while the underemployment rate fell by 0.64. Meanwhile, part-time workers increased by 0.41%. There were 1.64 million people (5.04% of the working-age population) affected by the pandemic; 116.65 thousand of them were unemployed (BPS Jawa Timur, 2022).

The data published by the Indonesian National Development Planning Agency (Bappenas RI) showed that the unemployment rate in East Java for the last five years has fluctuated. In 2018, it was 3.91%, which decreased to 3.83% in 2019. Then, it rose significantly to 5.84% in 2020 and fell to 5.74% and 4.81 in 2021 and 2022, respectively (Kementerian Perencanaan Pembangunan Nasional/ Badan Perencanaan Pembangunan Nasional, 2022). The open unemployment rate (TPT) in East Java reached 1.11 million people (Hakim, 2022).

East Java is one of the provinces with the highest population in Indonesia and the second highest number of unemployed in Indonesia. It is also one of the provinces with workers coming from various regions of Indonesia and industrial areas spread across multiple regions.

Table 1: Industrial Areas in East Java

No.	Industrial Areas	Locations
1.	Tuban Industrial Area (KIT)	Tuban
2.	Ngoro Industrial Park (NIP)	Mojokerto

No.	Industrial Areas	Locations
3.	Sidoarjo Rangkah Industrial Estate (SiRiE)	Sidoarjo
4.	Safe n Lock	Sidoarjo
5.	Gresik Industrial Area (KIG)	Gresik
6.	Java Integrated Industrial and Ports Estate (JIPE)	Gresik
7.	Maspion Industrial Area	Gresik
8.	Pasuruan Industrial Estate Rembang (PIER)	Pasuruan
9.	Surabaya Industrial Estate Rungkut (SIER-Berbek)	Surabaya
10.	Surabaya Industrial Estate Rungkut (SIER-Rungkut)	Surabaya

Source: Siki.jatimprov.go.id/RisetJatimnet.com

Table 1 shows that East Java has ten industrial zones. However, these seem insufficient to tackle the unemployment issue in the province. Thus, this research is required to provide some alternatives and policy recommendations for the issue.

2. Methodology

This study used a descriptive method and a problem-solving procedure related to the research objects based on factual information. The purpose of descriptive research is to make a systematic, factual, and accurate description or illustration of the facts about the phenomena being investigated (Nazir, 1988). Another source explained that the descriptive method is used to describe or analyze a certain phenomenon to find research results (Sugiyono, 2005). This type of method is fact-finding with a correct interpretation. In other words, it is research that attempts to describe signs or an event that is happening in the present time (Whitney, 1960).

2.1 Theoretical Framework

Unemployment Theory

Unemployment is a condition in which a person in the labor force wants to get a job.
Sukirno (2000) classified unemployment into four groups:

1. **Open unemployment**
   This type of unemployment is common because the number of labours exceeds the number of vacancies. As a result, many people remain employed for a long time. Open unemployment can also be a result of declining economic activities due to technological advances that reduce human labour at work.
2. **Disguised Unemployment**
   Disguised unemployment occurs when a small company has too many workers, thus resulting in inefficiency. Excess labor is also known as hidden unemployment.
3. **Underemployment**
   Underemployment is a condition where labourers work less than 35 hours a week. They may only work one to two days a week or one to four hours a day.
4. **Seasonal Unemployment**
   This type of unemployment is tied to a particular season. For example, farmers generally are not very active between planting and harvesting periods.

3. Results and Discussion

3.1 Unemployment Categories

There are three categories of unemployment as follows:

1. **Disguised Unemployment**
   Employees do not work optimally for a certain reason. In addition, disguised unemployment is people who are forced to work in a job that is not in their area of expertise because of the economic domain (Hussmanns, 2018);

2. **Underemployment**
   Employees who do not work optimally because there are no job opportunities. Usually these underemployment workers work less than 35 hours per week, wages, and productivity (Abomaye-nimenibo & Samuel, 2021);
3. **Open Unemployment**
   Open unemployment is a situation where people are not working or are still looking for work. Unemployment is caused by the unavailability of sufficient job opportunities and the abilities and skills of job applicants that are not in accordance with the qualifications and needs of the company.

3.2 Unemployment Rates in Java Island (2016—2021)

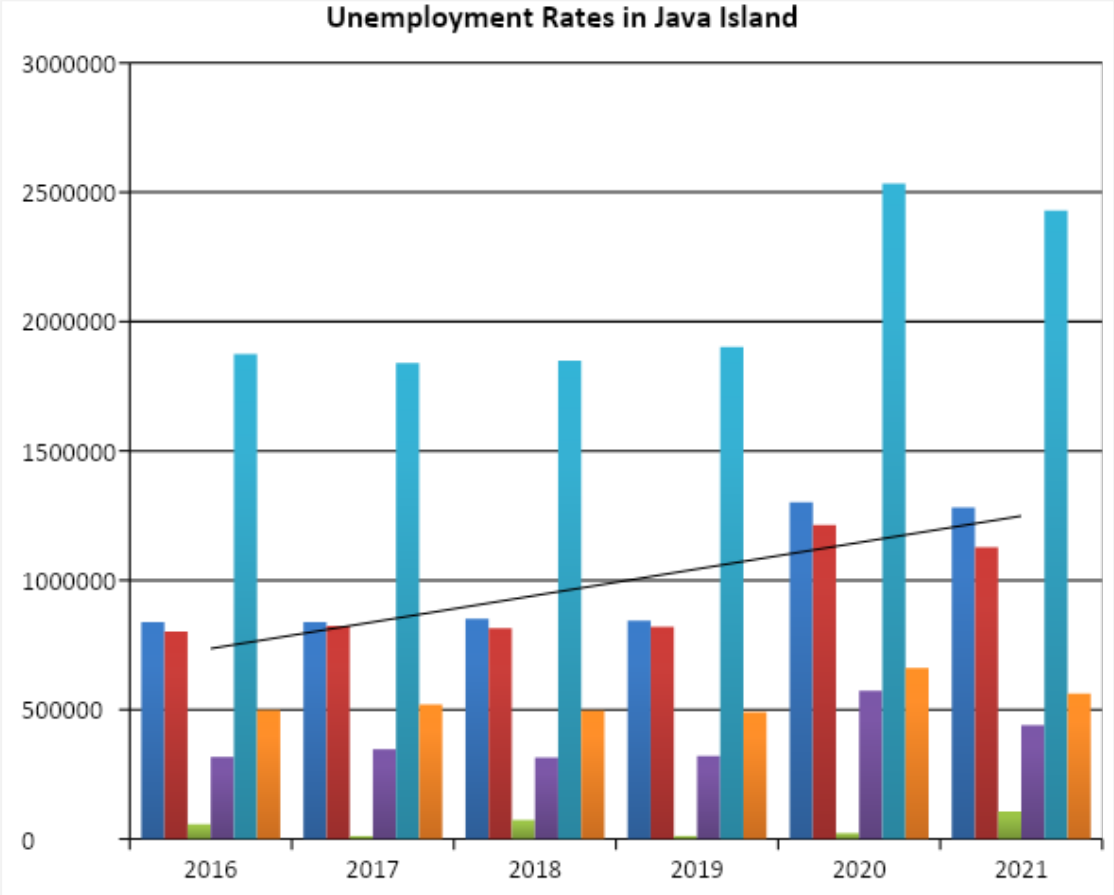


Figure 1. Diagram of the Unemployment Rate in Each Province of Java Island in the Period of 201-2021

As shown in Figure 1, East Java has the second highest unemployment rate after West Java Province. Every year, this rate fluctuates. In 2016, the number of unemployed people was 839,284 which decreased to 838,496 in 2017. In the following year, it increased by 11,978 people, making the total number 850,474 people. In 2019, it declined to 6,720 people. In the 2016 – 2019 period, there was a fluctuation. There was also a spike in 2020 by 452,391, with the total unemployment rate being 1,301,145 people. This suggests that the COVID-19 pandemic contributed significantly to the unemployment problem in East Java. In the next year, the number decreased by19,750 people, making the total unemployment rate in East Java 1,281,395 people.

3.3 Total Unemployment Rate of Each Province in Java Island (2016 - 2021)

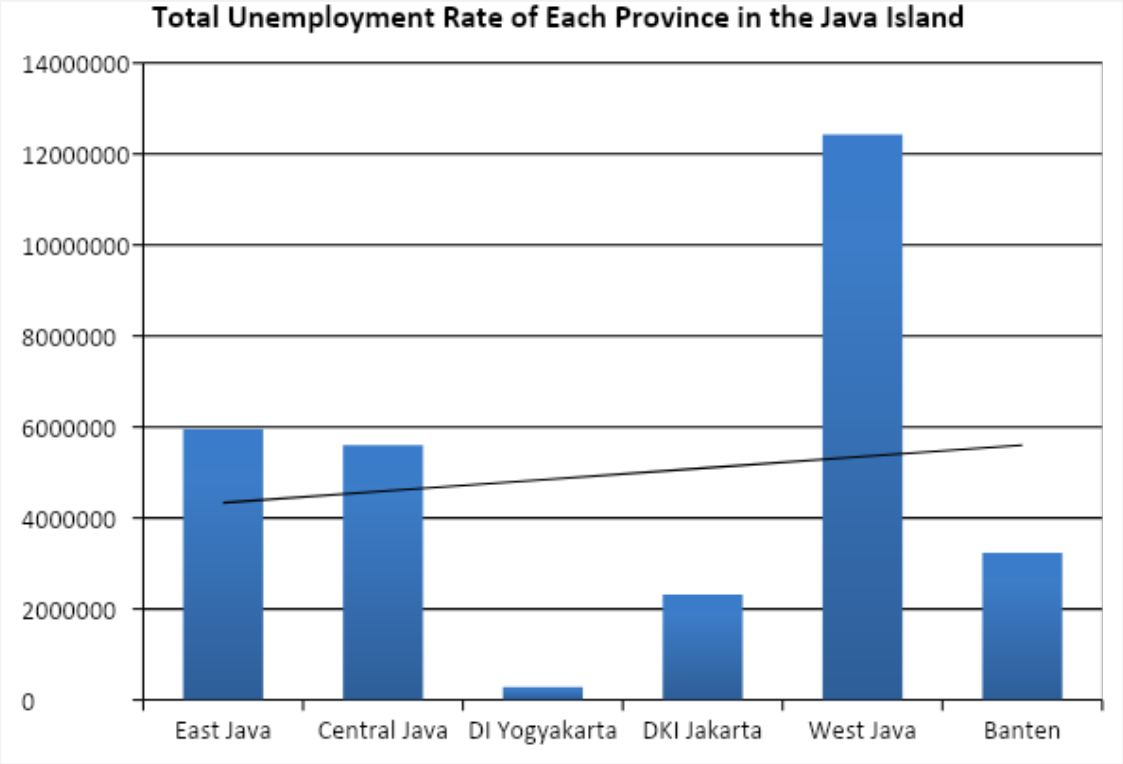


Figure 2. Diagram of Total Unemployment Rate of Each Province in Java Island in the Period of 2016 – 2021

Figure 2 shows the total number of unemployed people in the 2016-202 period in various provinces of Java Island. The province with the highest number of unemployed people was West Java (12,426,244 people), followed by East Java (5,954,548 people), Central Java (5,601,535 people), Banten (3,229,070 people), DKI Jakarta Province (2,312,373 people), and DI Yogyakarta Province (282,558 people). These data indicate that East Java had employment problems after the COVID-19 pandemic.

3.4 Fully Unemployed

East Java is one of the provinces in Indonesia with the largest population. In 2021, it had 40,878,789 people (BPS Jawa Timur, 2020) with the workforce being 22,180,000 people. When compared to 2021, the number of labor force in 2020 was lower by 86,340. The proportion of the working population recorded in 2021 was 21,030,000, while the number of jobless people was 1,146,706, with a labor force participation rate of 69.75% (Ryo, 2022).

Table 2: Job Seekers, Labor Force, and Unemployment Rates in the East Java Province (2016 – 2021)

Year	Number of Job Seekers	Number of Labor Force	Unemployment Rate (%)	↓↑
2016	646.414	11.920.804	5.42	
				1.42
2017	838.496	20.937.716	4.00	
				0.01

Year	Number of Job Seekers	Number of Labor Force	Unemployment Rate (%)	↓↑
2018	850.474	21.300.423	3.99	
				0.07
2019	843.754	21.499.386	3.92	
				1.92
2020	1.301.145	22.264.112	5.84	
				0.1
2021	1.281.395	22.319.145	5.74	

Sources: The calculation used the unemployment formula and statistical report central agency

Based on the mathematical calculations of the unemployment rate per year presented in Table 1, the unemployment rates in East Java in the last six years (2016 – 2021) fluctuated. In 2016, the rate was significantly higher (5.42%), which declined to 4% in 2017. This decline seems to be due to an increase in employment in East Java. In 2018, it declined again by 0.01%. Even though it was small, it indicates progress as the unemployment rate had reduced in the province that year. In the following year, there was also a decrease of 0.07%, with the total percentage being 3.92%, indicating East Java the labor population increased. However, in 2020 the unemployment rate rose dramatically by 1.92%, implying that the number of the labor force exceeded the number of available jobs, with layoffs being present. Then, in 2021, the percentage of the unemployed population decreased by 0.1%, with a total percentage of 5.7%4. This small decrease positively impacted employment absorption in East Java Province and the availability of job opportunities. The demand in the labor market also increased the absorption of labor in East Java. An explanation of the dynamics of the unemployment rate in East Java before and after the COVID-19 pandemic is shown in Figure 3 below.

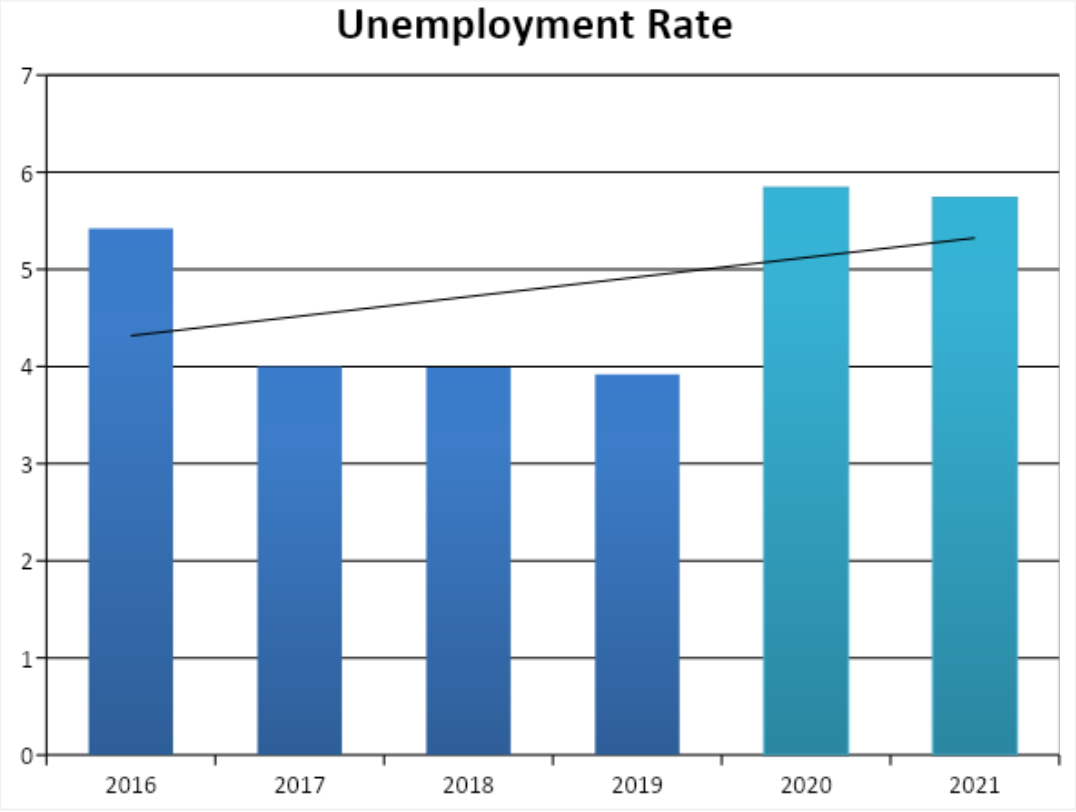


Figure 3. Diagram of the Unemployment Rate in East Java in the Period of 2016 - 2021

- The unemployment rate in East Java from 2016 to 2019 prior to the COVID-19 pandemic showed a positive direction, namely a steady decrease in the unemployment rate. This proves that prior to the pandemic, the workforce and employment opportunities were available for job seekers in East Java. There were employment opportunities in various sectors, absorption of labor, and reduced unemployment. Meanwhile, during the pandemic, the rate tended to increase, implying that the pandemic led to the emergence of employment problems in the province due to large-scale social restrictions (PSBB), which reduced the interaction intensity of the community. In the industrial sector, many companies terminated their employment relationships with their employees because of the deficits they experienced. The available job opportunities were limited, but the number of workers increased.

3.5 Fully Employed

Table 3. Fully Employed Rates

Year	Total of Employed People	Total of Unemployed People	Labor Force	Fully Employed Rates (%)	↓↑
2016	19.114.563	839.283	19.953.846	91.58	
					0.41
2017	20.099.220	838.496	20.937.716	91.99	
					0.02
2018	20.449.949	850.474	21.300.423	92.01	
					0.14
2019	20.655.632	843.754	21.499.386	92.15	
					3.84
2020	20.962.967	1.301.145	22.264.112	88.31	
					0.2
2021	21.037.750	1.281.395	22.319.145	88.51	

Sources: calculation with unemployment formula and central agency statistics report.

Table 2 above shows the rate of fully employed people in 2016 was 91.58. it means that the population working full-time in East Java was very high that year. Then, in 2017, the rate increased to 91.99%, indicating that the working population was increasing and the available job opportunities met the needs of job seekers, thus having a significant impact on the increase of fully-working people. In 2018, there was an increase of 0.02%, with the total percentage of the fully-working being 92.01%, meaning that the employment opportunities were balanced with the increase in the workforce in East Java. In 2019, the rate increased by 0.14%, with a total percentage of 92.15%, showing that the available job opportunities can meet the needs of the labor market in this province, and the absorption of labor was optimal. However, in 2020 the percentage decreased by 3.84%, with a total percentage of 88.31%, seemingly due to the decrease in employment opportunities and an increase in the number of jobless people. Then, in 2021 the percentage of the fully-working population rose by 0.2%, with a total percentage being 88.51%. This suggests that the availability of job opportunities and labour absorption in East Java started to recover. The dynamic rate of the fully-employed population can be seen in Figure 4 below.

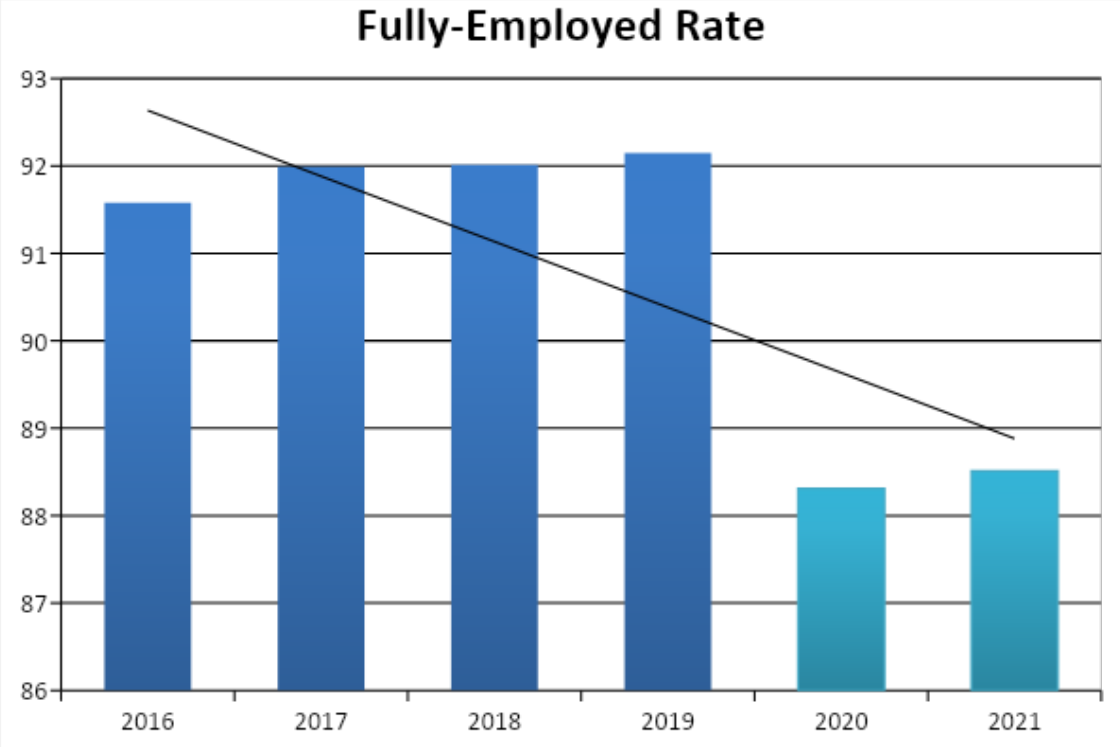


Figure 4. Diagram of Fully Employed Rate Pre-COVID-19 and Post-Covid-19 Pandemic in the Period of 2016 – 2021 in East Java

The rate of the fully-working population in the 2016 – 2019 period or before the COVID-19 pandemic tended to increase, which had a significant positive impact because workers were absorbed optimally. There were also sufficient job opportunities to meet the needs of the population who were looking for work. Meanwhile, the dynamic population rate which worked fully in the 2020-2021 period or after the COVID-19 pandemic tended to fluctuate because, in 2020, the rate of the fully employed population experienced a highly significant decrease, indicating that there was less amount of workforce absorption in the East Java, which may be due to employment relationship termination as a result of the COVID-19 pandemic. Meanwhile, in 2021, the percentage of the population fully employed increased significantly by 0.2%, with a total percentage of 88.51, meaning that the absorption of labor and employment has increased significantly.

3.6 Disguised Unemployed

Unemployment can be defined as workers with total working hours of less than 34 hours a week (Marini & Putri, 2020). Workers with relatively low working hours generally have low positions and wages that are directly proportional to their positions. This causes the population's work productivity to be low (Ukkas, 2017). The formula for determining Underemployed is as follows:

Table 4. Disguised Unemployment Rate

Year	Total of Unemployed People	Labor Force	Disguised Unemployed Rate (%)	↓↑
2016	839.283	19.953.846	4.20	
				0.2
2017	838.496	20.937.716	4.00	
				0.01

Year	Total of Unemployed People	Labor Force	Disguised Unemployed Rate (%)	↓↑
2018	850.474	21.300.423	3.99	
				0.07
2019	843.754	21.499.386	3.92	
				1.92
2020	1.301.145	22.264.112	5.84	
				0.1
2021	1.281.395	22.319.145	5.74	

Sources: calculation with unemployment formula and statistical report center

Table 3 shows that the percentage of disguised unemployed in East Java in 2016 was 4.20%. This means that the labor working less than 34 hours per week was quite high. In the next year, the rate decreased by 0.2%, with a total percentage of 4.00%, suggesting that the number of workers operating less than 34 hours was low. In 2018, the percentage of under-employed also decreased by 0.01%, with a total percentage of 3.99%. These show that the occurrence of unemployment or workers working less than 34 hours a week had decreased. In 2019, the percentage of under-employed decreased by 0.07%, with a total percentage of 3.92%. This shows that the rate of the fully-employed population had decreased. In 2021, the percentage of under-employed in East Java experienced a significant increase of 1.92%, with a total percentage of 5.84%. This proves that there is an increase in the population working less than 34 hours a week. In 2021, the percentage of under-employed decreased by 0.1%, with a total percentage of 5.74%, indicating that the population working less than 34 hours had decreased, and the availability of full-time employment significantly impacted reducing the under-employed population. The dynamic rate of the under-employed and its explanation pre-COVID-19 and post-COVID-19 pandemics can be seen in the following diagram.

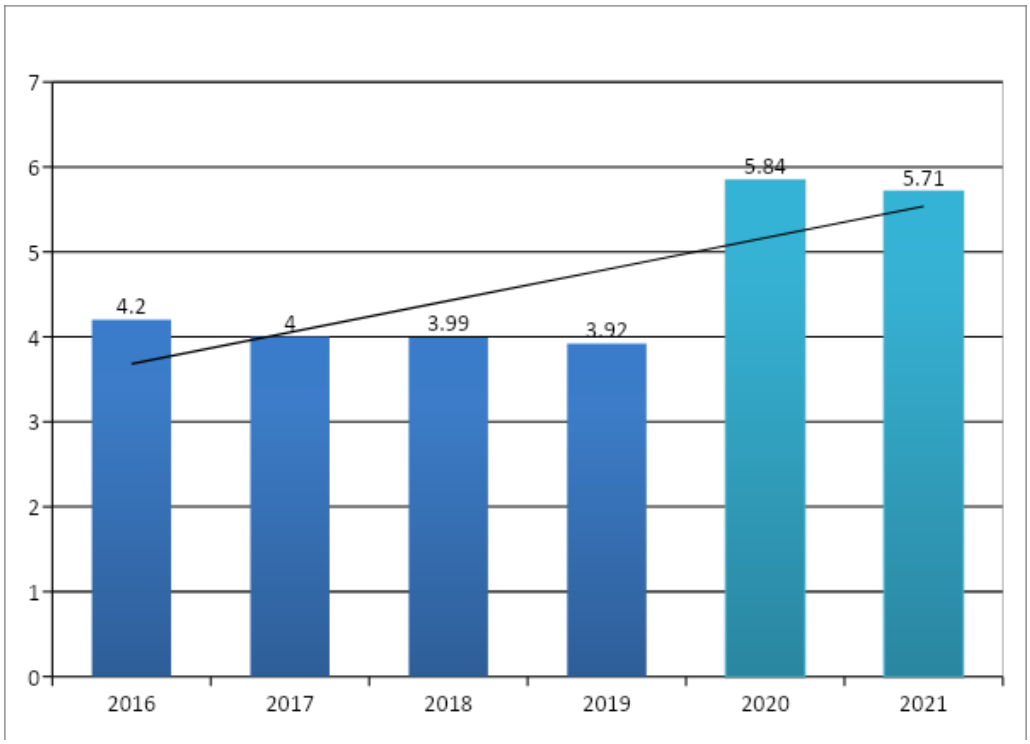


Figure 5. Diagram of Underemployment Rate during Pre-Covid-19 and Post-Covid-19 Pandemic in East Java in the Period of 2016 - 2021

The rate of disguised unemployment in East Java during the 2016 – 2019 period had been steady and tended to comply with a small decrease. This proves that in the pre-COVID-19 pandemic, the population working less than 34 hours or being partially unemployed was low because many companies set a full-time work system. However, the rate of under-employment in East Java for the 2020-2021 period experienced a gradual increase, showing that after the pandemic, many companies reduced the working hours and work intensity in the office by applying the working-from-home policy, or even temporarily laying off the employees.

3.7 Under Unemployment

Underemployed workers are those who work under normal working hours (less than 35 hours a week) and are still looking for job opportunities or are still willing to accept work (formerly called forced underemployment). The formula for determining Under Unemployment is as follows:

$$Under\ Unemployment\ (year) = \frac{PBJK < 35\ Hours}{PB}\ x\ 100\% =$$

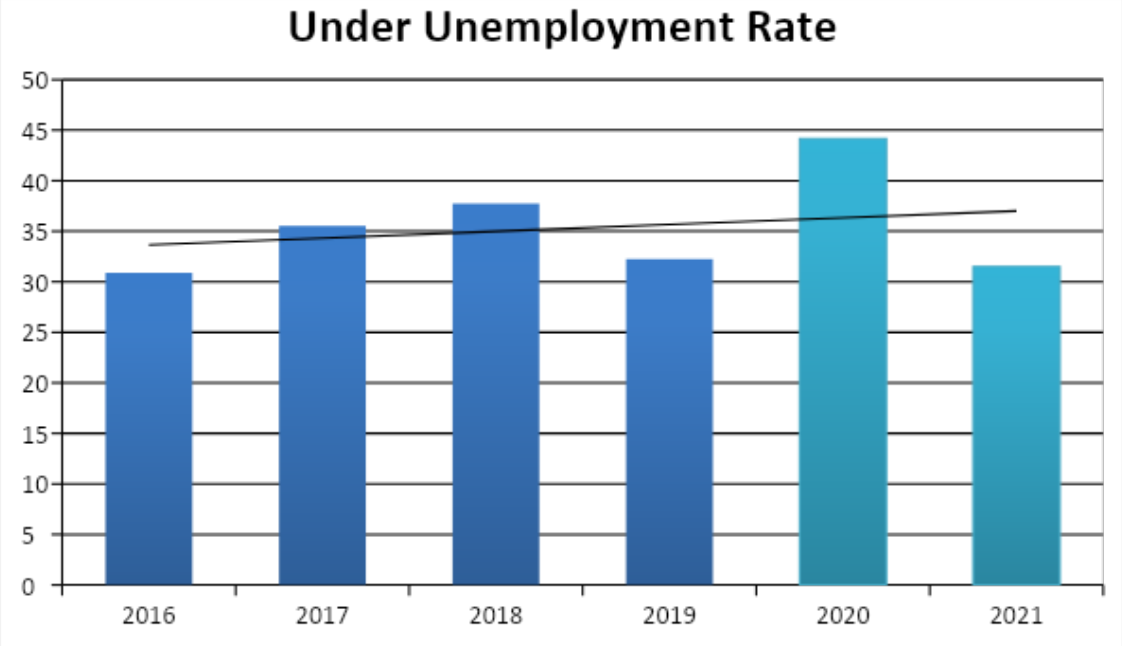


Figure 6. Diagram of the Unemployment Rate in East Java in the Period of 2016 - 2021

Conclusions

The government has made certain policies to tackle the impacts of the COVID-19 pandemic. Support from governmental institutions and non-governmental institutions can also contribute to tackling the impacts of the COVID-19 pandemic in various sectors. Prior to the COVID-19 pandemic, the available job opportunities met the needs of job seekers in the East Java Province. There were employment opportunities in various sectors, good labour absorption, and a low unemployment rate. During the pandemic, in the industrial sector, many companies terminated their employment relationships with their employees because of a deficit they encountered. The available job opportunities became limited, but the number of unemployed people increased.

Meanwhile, the percentage of the fully-employed population in the 2020-2021 period or after the COVID-19 pandemic tended to fluctuate because, in 2020, the percentage of the population fully employed experienced a highly significant decrease. This had a significant impact on the amount of labor absorption. The decrease in the proportion can also be interpreted as an increase in the population who did not work because of the employment relationship termination by many companies as a result of the COVID-19 pandemic.

Meanwhile, the rate of under-employment in the East Java Province for the 2020-2021 period experienced a dramatic increase, which shows that after the pandemic, many companies reduced the working hours and work intensity in the office by applying the work-from-home policy or even temporarily laying off their employees. This contributed to an increase in the rate of the under-employed population.

Recommendations

Policy recommendations that can be implemented by the government to solve the unemployment problems in East Java are as follows: (1). Creating Jobs, Unemployment is caused by an imbalance between the number of available job opportunities and labor. Therefore, the government can provide employment opportunities-based labour-intensive jobs as many as possible. Labour-intensive industries can also accommodate the creativity of the community. In addition to labour-intensive industries, the government can also seek capital-intensive industries by facilitating industrial development permits, and stabilizing domestic political conditions so that investment can run smoothly in Indonesia. (2). Improving the Quality of Manpower, One of the factors behind the high unemployment rate in Indonesia is the labour's poor skill or work performance. Therefore, it is highly necessary for an unemployed person to improve the quality of his work performance so that the unemployment rate will decrease. To improve work performance quality, training can be provided for professional development in addition to apprenticeship training in the workplace and holding a certification of skills that can support workers to get a job. (3). Development of the Informal Sector, The government can also improve the businesses in the informal sector. The informal sector saved Indonesia from the 1998 monetary crisis because bank interest rates did not bind the informal sector. Thus, the government can facilitate the informal sector by providing business areas for workers with low rent, easing access to obtain operating permission, and many others. This can solve unemployment problems because a high level of education is not compulsory to be able to work in this sector. The rapid population growth has made several companies in the formal sector experience problems in providing job opportunities. (4). Entrepreneurial Power, to increase the number of entrepreneurs, it is necessary to provide counselling, training, and capital or loans to raise people's enthusiasm to start a business. The presence of entrepreneurs can save the country's economy and help overcome unemployment control. The government needs supervision so these entrepreneurs can continue running their businesses properly.

References

Abomaye-nimenibo, P. P., & Samuel, W. A. (2021). Which of these economics jargons - underemployment, overemployment, unemployment, rightemployment, overqualification and overeducation is appropriate for an economy? *Global Journal of HUMAN-SOCIAL SCIENCE: E Economics*, *21*(4).

Badan Pusat Statistik. (2022). *Keadaan Ketenagakerjaan Indonesia Februari 2022*. https://www.bps.go.id/publication/2022/06/07/76fb4f0b11d3fc22f135a178/keadaan-pekerja-di-indonesia-februari-2022-.html

Badan Pusat Statistik Jawa Timur. (2020). *Hasil sensus penduduk 2020 Provinsi Jawa Timur*. https://jatim.bps.go.id/

Badan Pusat Statistik Jawa Timur. (2021). *Tingkat pengangguran terbuka (TPT) provinsi Jawa Timur (persen), 2019-2021*. https://jatim.bps.go.id/indicator/6/54/1/tingkat-pengangguran-terbuka-tpt-provinsi-jawa-timur.html

Badan Pusat Statistik Jawa Timur. (2022). *Keadaan ketenagakerjaan Jawa Timur februari 2022*. https://jatim.bps.go.id/

Binalovotas. (2020). *Upaya kemnaker mitigasi dampak pandemi covid-19 dan atasi pengangguran*. Kementrian Ketenagakerjaan Republik Indonesia. https://kemnaker.go.id/news/detail/upaya-kemnaker-mitigasi-dampak-pandemi-covid-19-dan-atasi-pengangguran

Dinas Komunikasi dan Informatika Jawa Timur. (2021). *Disnakertrans jatim bersinergi dengan upt ketenagakerjaan se jawa timur turunkan angka pengangguran*. Jatim Newsroom. https://kominfo.jatimprov.go.id/read/umum/disnakertrans-jatim-bersinergi-dengan-upt-ketenagakerjaan-se-jawa-timur-turunkan-angka-pengangguran-

Hakim, L. (2022). *Waduh! 1,11 juta warga Jawa Timur menganggur?* INews Malang. https://malang.inews.id/read/80837/waduh-111-juta-warga-jawa-timur-menganggur

Herniwati, D. P., & Handayani, R. (2019). Pengangguran terbuka di Provinsi Jawa Tengah. *Diponegoro Journal of Economics*, *1*, 159. https://ejournal2.undip.ac.id/index.php/dje

Hussmanns, R. (2018). Measurement of employment, unemployment and underemployment – Current international standards and issues in their application. *Bulletin of Labour Statistics*, *1*.

Jumena, J., & Ikhsanti, I. (2015). Pengaruh sistem pembagian upah waktu kerja dan hasil kerja terhadap produktivitas kerja karyawan pabrik batu alam CV. Nur Alam Jaya Cirebon. *Jurnal Hukum Ekonomi Syariah*, *3*(1), 66.

Kementerian Perencanaan Pembangunan Nasional/Badan Perencanaan Pembangunan Nasional. (2022). *Capaian indikator utama pembangunan*. Sistem Informasi Dan Manajemen Datadasar Regional. https://simreg.bappenas.go.id/home/pemantauan/tpt

Mankiw, N. G. (2003). *Makro ekonomi* (F. Liza & I. Nurmawan, Trans.; 5th ed.). Macroeconomics. (Original work published 1997).

Marini, L., & Putri, N. T. (2020). Peluang terjadinya pengangguran di provinsi bengkulu : seberapa besar? *Convergence: The Journal of Economic Development*, *1*(2), 70–83. https://doi.org/10.33369/convergence-jep.v1i2.10900

Mujanah, S. (2019). *Manajemen kompensasi*. Putra Media Nusantara.

Nanga, M. (2005). *Makro ekonomi: Teori, masalah, dan kebijakan*. Grafindo Persada.

Nasrullah, J. A. (2015). *Sosiologi perkotaan: Memahami masyarakat kota dan problematika* (1st ed.). Pustaka Setia.

Nazir, M. (1988). *Metode penelitian*. Ghalia Indonesia.

Rahmawati. (2016). *Manajemen pemasaran* (T. Fitriastuti & Kiswanto, Eds.). Mulawarman University Press.

Ruspendi. (2021). *Dampak pandemi covid-19 terhadap dunia usaha dan persaingan tenaga kerja*. Teknik Industri Universitas Pamulang. http://industri.unpam.ac.id/dampak-pandemi-covid-19-terhadap-dunia-usaha-dan-persaingan-tenaga-kerja/

Ryo, S. (2022). *BPS catat februari 2021 angkatan kerja di jatim 22,18 juta orang*. Dinas Kominfo Jatim. https://kominfo.jatimprov.go.id/read/umum/bps-catat-februari-2021-angkatan-kerja-di-jatim-22-18-juta-orang

Sholeh, M. (2007). Permintaan dan penawaran tenaga kerja serta upah: Teori serta beberapa potretnya di Indonesia. *Jurnal Ekonomi & Pendidikan*, *4*(1), 62–74. https://doi.org/https://doi.org/10.21831/jep.v4i1.618

Sugiyono. (2005). *Memahami penelitian kualitatif*. Alfabeta.

Sukirno, S. (2000). *Makro ekonomi modern, perkembangan pemikiran dari klasik hingga keynesian baru*. Raja Grafindo Persada.

Trimaya, A. (2014). Pemberlakuan upah minimum dalam sistem pengupahan nasional untuk meningkatkan kesejahteraan tenaga kerja. *Aspirasi: Jurnal Masalah-Masalah Sosial*, *5*(1), 12.

Ukkas, I. (2017). Faktor-Faktor yang mempengaruhi produktivitas tenaga kerja industri kecil Kota Palopo. *Kelola: Journal of Islamic Education Management*, *2*(2). https://doi.org/10.24256/kelola.v2i2.440

Whitney, F. (1960). *The element of research*. Prentice-Hall, Inc.

Zainal, A. (2006). *Dasar-Dasar Hukum Perburuhan*. Raja Grafindo.

[Undang-undang Republik Indonesia tentang ketenagakerjaan]. (2003). https://kemenperin.go.id/kompetensi/UU_13_2003.pdf

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 2- AUGUST 2022

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Policy Paper

Can Regional Spending Management Policies Improve Human Development Index?

Iwa Kartiwa Karpi[1]; Yanne Yuniarti Widayat[2*]; Novi Eka Ratnasari[3]; M.D Enjat Munajat[4]

Department of Public Policy, Faculty of Social and Political Sciences, Padjadjaran University, Bandung, Indonesia [1,2,3,4]

***) Corresponding author**: yanne21001@mail.unpad.ac.id

ABSTRACT

The management of expenditure carried out by local governments until now is considered not effective and efficient enough, so the government, through Law Number 1 of 2022 (articles 146 and 147) seeks to increase the effectiveness of regional expenditure in regional development by regulating the proportion of employee spending and public service infrastructure spending. This article aims to evaluate regional spending management policies in increasing Human Development Index (HDI) in the Bima regency. This regency was chosen as the research location because it has a fairly large employee expenditure allocation which is 49.29 percent of the total regional expenditure, with an increase in HDI of 0.36. Data analysis was carried out using *Tableau* applications and cost-effectiveness analysis. The results show that in comparison to other Indonesian eastern districts, the Bima region does not manage regional expenditures efficiently. Meanwhile, the results of the 2022-2025 HDI forecast only increased by 0.611 per year. The estimated HDI in 2024 is 69,02863, which is still far below the 2024 HDI target of 75.54. Suggestively, the Bima regency needs to allocate budgets selectively for the HDI driving sector and decrease the employee spending rate.

Keywords: Decentralization; Regional Development; Regional Spending; Mandatory Spending; Cost-effectiveness analysis

ARTICLE INFO

Received: July 4, 2022
Received in revised form: August 21, 2022
Accepted: August 27, 2022
doi: 10.46456/jisdep.v3i2.309

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70, Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail: journal.pusbindiklatren@bappenas.go.id

Supported by Indonesian Development Planners Association (PPPI)

1. Introduction

In September 2015, the United Nations adopted the 2030 sustainable development agenda to eradicate poverty, combat inequality and injustice, and save the planet by protecting the environment. The 2030 agenda includes a set of 17 Sustainable Development Goals (SDGs) and 169 target projects to assess and monitor sustainable development by 2030 (Benedek et al., 2021). Indonesia has implemented regional autonomy, where each respective region delegates rights and authority for development. Once the authority to manage regional expenditures is handed over to local governments in the hope that local governments can manage regional expenditures effectively and be able to increase HDI in accordance with the SDGs achievement, it will certainly facilitate the process of achieving the goals of the SDGs itself.

Decentralization in Indonesia has been running since the enactment of Law Number 22 of 1999 concerning Regional Government and Law Number 25 of 1999 concerning Financial Balance between the Central and Regional Governments. One of the impacts is that local governments have the potential to achieve effectiveness and efficiency in financial management because government decisions are more aligned with the desires and requirements of their communities (Alm et al., 2001). Unfortunately, financial management by local governments has not progressed as expected. This is due to the management's continuing disregard for the community welfare and the inadequate budgeting, legislation, and control function of the Regional Legislative Council (DPRD) (Karianga, 2017).

Regional financial management is annually discussed and approved jointly by the local government and the Regional House of Representatives to be determined through regional regulations on the Regional Revenue and Expenditure Budget. At the end of the relevant year, the government makes a budget realization report which is a form of accountability for local governments. One of the contents contained in the budget realization report is regional expenditure. According to Minister of Home Affairs Regulation (Permendagri) Number 13, of 2006, regional expenditure is the overall liabilities of local governments which are identified as an inference from the value of net worth. In the budget realization report following with Minister of Home Affairs Regulation (Permendagri) Number 77 of 2020, regional expenditures have four types of categories, namely operating expenditures (employee expenditures, goods and services expenditures, interest expenditures, grant expenditure subsidy expenditures, and social assistance expenditures), capital expenditures, unexpected expenditures, and transfer expenditures. In certain regions of Indonesia, regional spending has a substantial impact on regional development (Hadi, 2011; Priambodo & Noor, 2016; Rosmadayanti et al., 2021; Rustariyuni, 2014; Sari & Supadmi, 2016)

In the domain of regional development, the Human Development Index (HDI) is established as the main indicator to measure the success of regional development; and through HDI, we can also design policies to achieve the regional development goals, especially those related to the SDGs (United Nations Development [UNDP], 2020). In other words, an improvement in the SDGs' achievement can be shown by an increase in HDI (Arriani & Chotib, 2021; Jain & Jain, 2020; Requejo-Castro et al., 2020). However, suppose the data from the Central Statistics Agency are being reviewed. In that case, it is known that the HDI of the provinces of the eastern Indonesia region is still lagging behind the western region. The acceleration of human development can be made through equal income distribution and the adequacy of public expenditure for the education and health sectors (Zulyanto, 2016). It is undeniable that in addition to population indicators and economic growth, the human development index indicator is another indicator that affects income inequality (Rahmawati et al., 2020). Local governments play an important role in managing public expenditure because more than half of public expenditure is managed by local governments. However, greater effort is required to improve management's effectiveness and efficiency. (World Bank, 2020). The results of the IMF Working Paper Report (2019) show that public social spending influences gross national income per capita, expected length of schooling, and life expectancy, so if the government wants to increase these three variables, the government needs to allocate more regional budgets for public spending (Paliova et al., 2019).

Local governments need to pay attention to the allocation of public expenditure since the success of achieving the SDGs goals in the regions largely depends on the ability of local governments to develop regional expenditure allocation plans on programs related to the public interest to support the achievement of the SDGs goals (Badan Perencanaan Pembangunan Nasional [Bappenas], 2017; Haryanto, 2015; Kharas & Mcarthur, 2019; Sisto et al., 2020). Furthermore, relatively low public spending leads to

local governments's incapability to provide adequate public services for their communities which will affect the decline in community welfare (Amalia & Purbadharmaja, 2015)

As a key factor for national growth and development, public spending is used to finance health and education services and infrastructure projects, including roads, electricity, and water(Hall, 2014).Therefore, through Law Number 1 of 2022 concerning Financial Relations between the Central and Regional Governments, the government tries to increase the efficiency of regional spending so that it can be optimal in encouraging the achievement of development results and regional economic growth. The law regulates the obligation of local governments to allocate employee expenditures a maximum of 30 percent (article 146) and an allocation of public service infrastructure expenditures of at least 40 percent (article 147) of the total regional expenditure.

Previous research on the evaluation of regional spending gives varying results. Some studies state that there is a significant positive relationship between regional spending and the human development index (Fattah, 2012; Ferraz et al., 2020; Handayani et al., 2022; Jaya, 2021; Martinidis et al., 2022; Masduki et al., 2021; Raya, 2021; Rustariyuni, 2014; Sari et al., 2021; Sippa & Saleh, 2021), while some other studies state that there is no relationship between regional spending and the human development index (Williantara & Budiasih, 2016; Muliza et al., 2017; Zuraida, 2017; Bandiyono, 2018; Krismanjaya & Dewi, 2019; Nababan, 2020; Ningrum & Nuryadin, 2021). Based on previous studies, writings that examine the relationship between the Human Development Index and regional spending management policies in Bima Regency have never been carried out, so it is interesting to conduct further research.

In conducting policy evaluations, summative and formative research questions were constructed. Summative questions functioning to prove accountability are asked to find out what and how effectively regional spending is produced. Formative questions which functions to improve aims for improvement (Knowlton & Phillips, 2013). In this study, the summative question was *"How the effectiveness/efficiency of regional spending in 2021 on regional development?"* In addition to summative questions, researchers also built formative questions, namely *"How will the adjustments to regional spending allocations be made to improve regional development?"*

To answer the questions above, this paper aims to analyze regional spending management policies through evaluation and forecast of regional expenditure management toward increasing the HDI. Bima regency was chosen as the research location because it has a fairly large employee expenditure allocation of 49.29 percent of the total regional expenditure, with an increase in HDI of 0.36. This is supported by education statistics data published by Badan Pusat Statistik (BPS) from 2018 to 2021, which shows that within three years, there has been an increase in the percentage of illiteracy percentage of the population aged 15 years and over in Bima regency, from 2017 which was only 10.59 percent to 11.44 percent. The average number of school years in Bima regency within three years has decreased, from 8.15 percent in 2017 to 7.78 percent. The evaluation results are expected to be used as input in the preparation of the regional budget so that the allocation of personnel and infrastructure expenditures can be in accordance with Law No. 1 of 2022. Program evaluation is the systematic collection of information to make decisions in improving the effectiveness of the program and/or generating knowledge to inform decisions about future programs. Evaluation can also be carried out for policies, organizations, and employees (Patton, 2002).

In this study, we also used an analysis method different from that used in previous studies by using multiple data analysis methods, namely (1) analysis based on data processing through the *Tableau* application and (2) cost-effectiveness analysis. The use of this dual analysis method is expected to provide more accurate results. In addition, in this article, a forecast of HDI conditions in 2021-2025 is also carried out so that the government can take anticipatory and strategic steps.

2. Methodology

This study was conducted in Bima regency, situated on the island of Sumbawa's easternmost point, West Nusa Tenggara Province and adjacent to Bima city. In 2020 the population in Bima Regency reached 532,677 people with an area of 437,465 Ha or 4,394.38 km2 consisting of 18 sub-districts and 191 villages. Bima regency has a regional revenue and expenditure budget (APBD) of IDR 1.778.713.865742- with a fairly large allocation of personnel expenditure, which is 49.29 percent of the total regional expenditure.

However, the increase in HDI in Bima Regency is not too significant when compared to the total realized regional expenditure compared to other Indonesian eastern regions.

The data used in this study were taken from public and official databases provided by *Badan Pusat Statistik* (Central Bureau of Statistics), which is available at https://www.bps.go.id/indicator-indeks-pembangunan-manusia.html and data from *Kementerian Keuangan Indonesia* (Ministry of Finance) which is available at https://djpk.kemenkeu.go.id. The data from the Central Bureau of Statistics (BPS) is used to obtain information regarding the increase in HDI in 2019-2021 in Indonesia, and those from the Directorate General of Financial Balance (DJPK) Ministry of Finance are used to see the realization of regional spending in 2021.

After the data were obtained, an evaluation analysis of regional spending policies was carried out with a cost-effectiveness analysis approach. Cost-effectiveness analysis was a part of efficiency analysis. This analysis compared the relative efficiency between programs/policies with approximately similar/equal objectives and outcomes based on the input values shown in the monetary unit (Rossi et al., 2004). In this study, the evaluation instrument is in the form of spending realization and changes (increases/decreases) in HDI in the 2021 period. The evaluation results are expected to prepare the APBD in the next period.

In addition to evaluating cost-effectiveness analysis, this study also processed data through the application. The application used in data processing was *Tableau Desktop 2020.3* free license edition for academic purposes. This application is considered capable of mapping and representing data visualization and achieving required analyses in the research process (Kusumasari et al., 2022). *Tableau* is easy to use; it has several advantages when used as a business intelligence over Microsoft Excel (Effendy et al., 2021), among others are:

1. data visualization becomes easier, especially in the form of graph or image views, so that patterns, trends, or relationships between data points can be found;
2. the drag and drop feature makes tableau very easy to use;
3. support geographic location features by using existing special data;
4. the drill-down feature that supports by tableau can increase user insights in obtaining information;
5. Tableau's flexibility allows users to see the number of calculated numbers coming from a data set without having to manually type in calculation formulas; and
6. Tableau can analyze data from a variety of different sources by importing the required data sets into tableau.

The recommendations in this study are presented based on the results of the evaluation of regional spending on HDI in 2021 through these two instruments, which are connected with regional spending management policies.

3. Results and Discussions

3.1 HDI and Regional Spending

Analysis of the Human Development Index period 2020-2021 in Indonesia was processed using the tableau. HDI explains the extent to which Indonesian residents can access development outcomes in obtaining income, health, education, and other facilities provided by the government. The following is an analysis of HDI in Indonesia, where data is obtained from BPS and then processed using *tableau*.

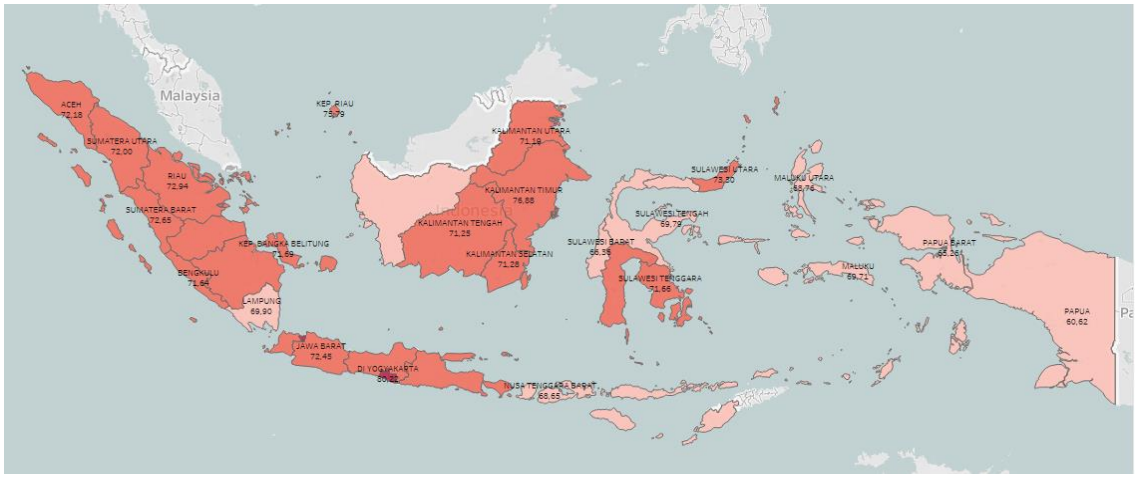


Figure 2. HDI by The Province in 2021
Source: BPS (data analysis)

Figure 2 shows that the HDI in the West Indonesia Region is mostly in the high category, and only a few are in the medium category. This is in contrast to the HDI of the eastern Indonesian provinces, which is still lagging behind the western regions, where only four provinces (Bali, North Sulawesi, South Sulawesi, and Southeast Sulawesi) have a high category HDI (between 70—80), while the rest have a moderate category HDI. This shows that there is still a high development gap between regions in Indonesia, even though, in its essence, the key policy is to reduce the development gap between regions with the principle of efforts to improve the quality of human life.

The disparities that occur between regions in Indonesia are our concern for further analysis. One of the reasons for the low HDI is the lack of optimal management of regional expenditures. Regional expenditures in Indonesia are mostly used for personnel expenditures, with a portion of around 32.4 percent, while spending on infrastructure is around 11.5 percent. Further analysis of the management of regional expenditures and the increase in HDI in Eastern Indonesia can be seen in **Figure 3**.

To see the efficiency of regional expenditure management, comparisons were made between regional governments in the eastern parts of Indonesia by comparing spending and increasing regional HDI to the regional average level. The results are grouped into four quadrants which can be seen in Figure 3. The average regional expenditure is Rp.936 billion and the average regional HDI increase (HDI 2021 – HDI 2020) is 0.280. Quadrant one is an area with a low level of efficiency. Regional governments that are in quadrant one have regional expenditures above the average with an increase in HDI that is below the average. Quadrant two is an area with a medium efficiency level. Regional governments that are in quadrant two have regional expenditures above the average with an increase in HDI that is above average. Quadrant three is an area with a medium efficiency level. Regional governments that are in quadrant three have regional expenditures below the average with an increase in HDI that is below the average. Last, quadrant four is an area with a high level of efficiency or in the best condition. Regional governments that are in quadrant four have regional expenditures below the average with an increase in HDI that is above the average; whereas Bima regency has a regional expenditure of Rp.1.465 billion and an increase in HDI of 0.36 as it is posited in quadrant two. This is interesting fact because Bima regency budget is quite large but the HDI increase is not significant.

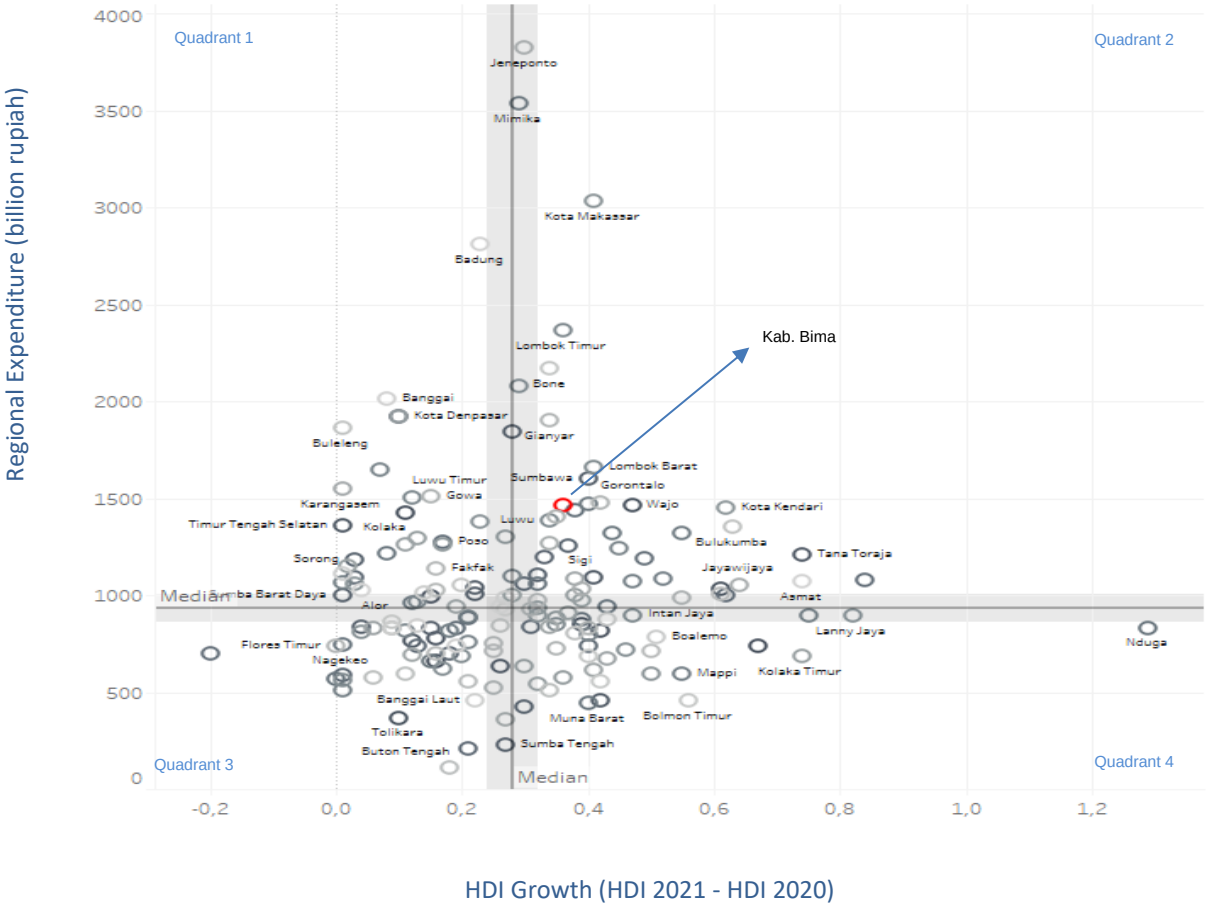


Figure 3. Regional spending and HDI growth in eastern Indonesia in 2021
Source: DJPK Kemenkeu (realization of spending), BPS (HDI) (data analysis)

3.2 Cost-Effectiveness Analysis

HDI plays an important role in encouraging the creation of development in Indonesia, especially in the economic sector. In modern economic development, good human development is needed to increase productivity and job opportunities. The previous analysis showed that, for the eastern Indonesia regions, only a few regions entered the high HDI category, the rest were in the medium and low categories. Compared to the Western Indonesia regions, eastern Indonesia regions lag because of this reason. The unresolved problems occuring in eastern Indonesia are basic problems such as the low net enrollment rate for school children, the lack of health facilities, and the difficulty of accessing proper drinking water. Therefore, there is a need for a strategy to overcome inequality between regions through improving the quality of regional spending to be more focused and optimal.

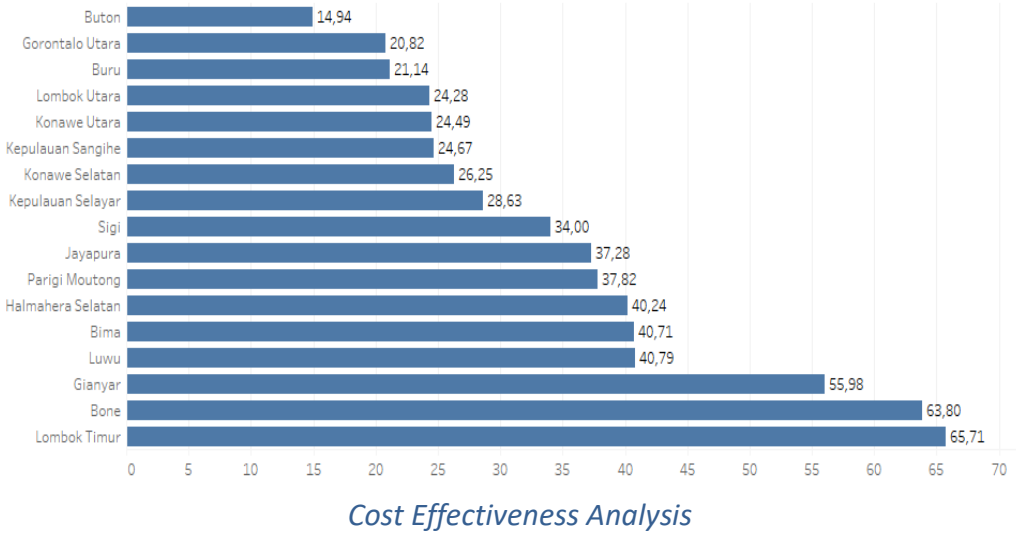


Figure 4. Cost-Effectiveness Analysis in Eastern Regency with An Increase in HDI of 0.34-0.38 in 2021
Source: DJPK Kemenkeu (realization of spending), BPS (HDI) (data analysis)

After analyzing the HDI and regional expenditures, then an evaluation using cost-effectiveness analysis was carried out by comparing eastern regencies that had an increase in HDI in the range of 0.34 - 0.38 and comparing the proportion of employee spending in each region, with the results shown in **Figure 4.**

Figure 4 shows the regional spending needed to increase HDI by 0.01. The smaller the value of regional spending needed, the more efficient regional spending used in increasing HDI. Using a cost-effectiveness analysis, it shows that of the seventeen regencies in eastern Indonesia with an increase in HDI in 2021 of 0.34 - 0.38, Bima regency is in 13th place with a cost efficiency value of 40.71 which means that to increase the HDI by 0.01, it requires Rp.40.71 billion of regional expenditure. This shows that the Bima Regency in increasing the HDI is 3 times higher than the Buton regency which only needs Rp.14.94 billion to increase the HDI. This means that Bima regency is not efficient enough in managing regional expenditures.

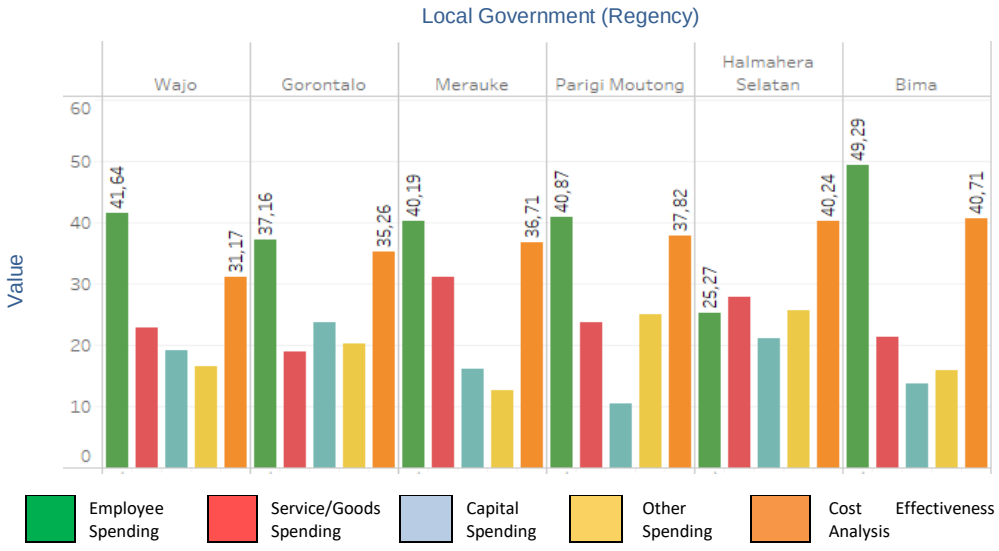


Figure 5. Cost-Effectiveness Analysis in Regency with A Regional Expenditure Value of Rp. 1,400-1,500 billion
Source: DJPK Kemenkeu (realization of spending), BPS (HDI) (data analysis)

The same analysis was carried out on regency governments with a regional expenditure value of Rp.1,400-1,500 billion, with the results as provided in **Figure 5**.

From the figure above, it is learned that the Bima regency is ranked sixth out of six regencies in the East Indonesia region with the realization of a regional expenditure of Rp. 1,400-1,500 billion, in terms of regional spending efficiency towards increasing HDI. Figure 5 also shows that the proportion of employee spending in the Bima regency is still much larger than in other regions.

3.3 Future Forecast of Human Development Index in Bima Regency

Forecasting is the activity of making predictions as accurately as possible, based on all available data, including historic data and insights about future events that may have an impact on forecasts (Hyndman & Athanasopoulos, 2018). Forecasting and planning are important aspects of policy science, especially those related to policy design, because the concepts of forecasting and planning can be a tool to form useful policy science concepts (Jantsch, 1970). In future planning, forecasting is the potential to be the foundation for the Bima regency government in predicting what will happen in the future, which can later change current habits so that the future will be better and more developed.

In this study, the forecasting of the human development index was carried out using the *Tableau* application, based on the data on the Number of HDI of the Bima regency. Forecasting at *tableau* uses exponential smoothing techniques by finding regular patterns in size that can be continued. The results of forecasting the HDI of the Bima regency are shown in **Figure 6**.

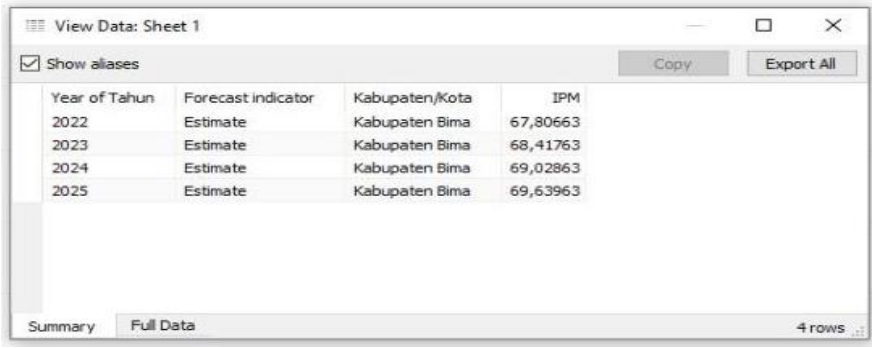


Figure 6. Bima Regency HDI Forecast for 2022-2025
Source: BPS (data analysis)

Data processing was carried out using the *Tableau* application based on the HDI period 2010-2021. The resulting trend is linear with an R-Squared of 0.9888954. Furthermore, IPM forecasting is carried out in 2022-2025. The results show an increase in HDI of 0.611 per year with an estimated HDI in 2025 of 69.63963. The model shows an R-Square value of 0.995993, indicating that the model-issued regression is very good. The estimated value of the 2022—2025 HDI is still in the moderate category; consequently, the local governments still need strategic steps to increase HDI to reach the high category.

3.4 Bima Regency Spending Policy

Bima regency's spending policies prioritize expenditures that must be paid in the relevant year, namely employee spending, goods and services expenditures, interest expenditures, subsidy expenditures (included in the operational expenditure category), and loan principal payments. The remaining funds between the estimated available funds and operational expenditures are allocated to development expenditures which are prioritized for improving the community's quality of life, basic services, education, health, social and public facilities, and developing social security systems. The proportion of regional expenditure in the Bima regency in 2016-2021 can be seen in **Figure 7**.

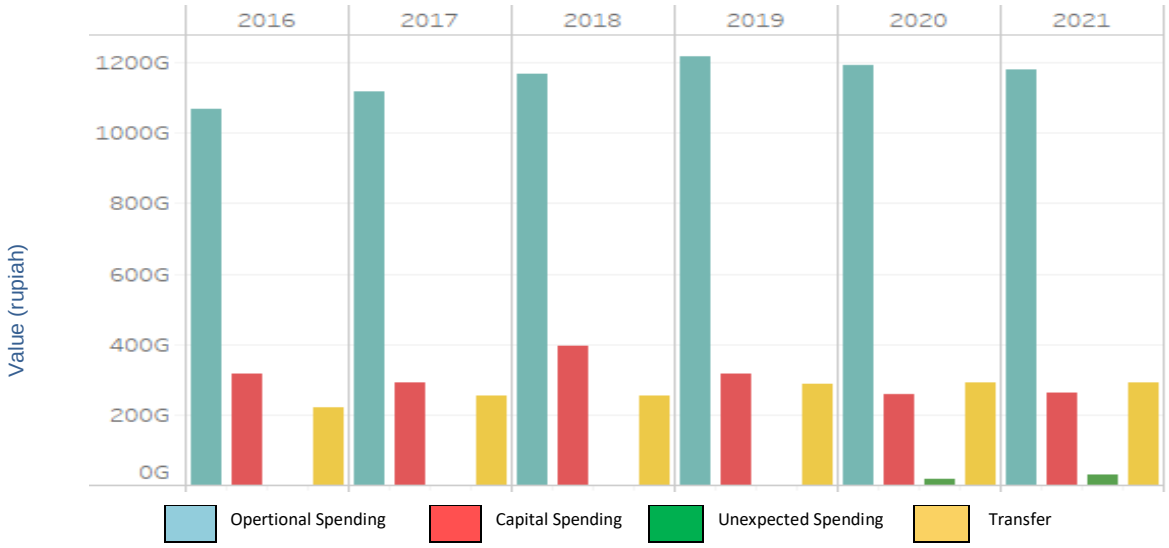


Figure 7. Regional Expenditure Proportion in Bima Recency in 2016-2021
Source: Bima Regency Government

Figure 8 shows that regional expenditures in the Bima regency are still dominated by operational expenditures such as employee spending, service goods expenditure, interest expenditure, subsidy expenditure, grant spending, and social assistance, with a value that tends to increase.

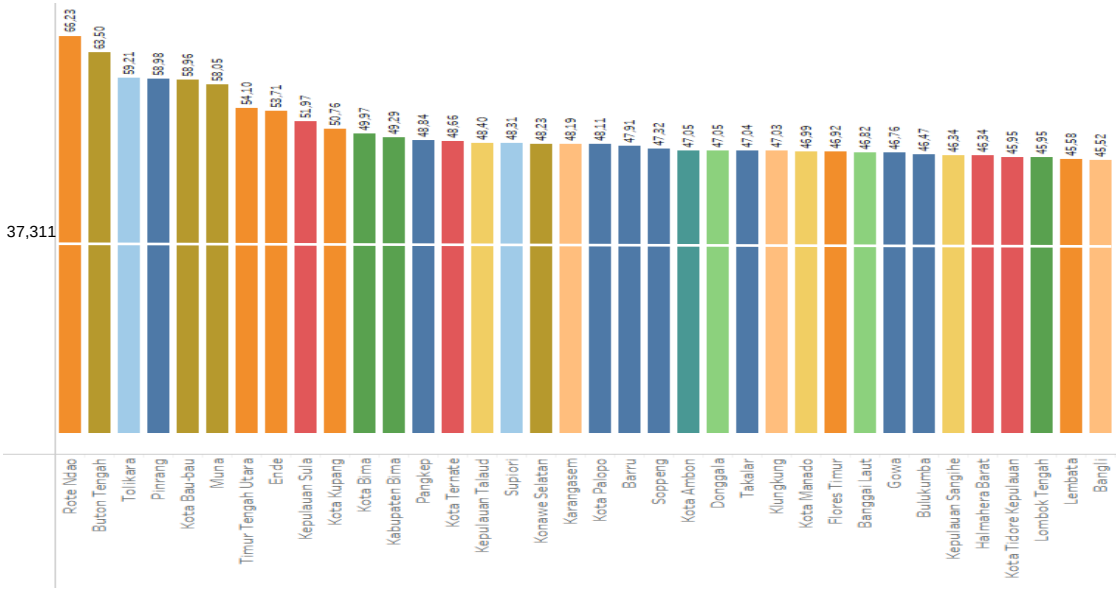


Figure 8. The eastern regional government, which has the proportion of employee spending in 2021> 45%
Source : djpk kemenkeu (processed data)

3.4.1. Employee Spending

Employee spending is expenses given to civil servants, state administrators, and honorary employees in exchange for work that supports the duties and functions of government. Employee spending is routine and binding. Employee spending is allocated for 13 months' payment. Other spending allocations are adjusted after employee spending is established.

The average proportion of employee spending in 2021 to local governments in eastern Indonesia was 37.31 percent. Figure 8 shows district/city governments in the eastern regions with a proportion of employee spending above 45 percent. Bima regency is in the top 12th place with a proportion of 49.29 percent. This figure is still far from the proportion regulated in Law Number 1 of 2022, which is a maximum of 30 percent.

Employee spending is influenced by the number of State Civil Apparatus (ASN) professional expenses. In December 2021, Bima regency had a total of 7,395 ASN, with an age range of 23-60 years, with details in **Table 1**.

Table 1: The Number of ASNs of Bima Regency by Employee Age as per December 2021

	50–60 years old	40–49 years old	30–39 years old	20–29 years old	Total
Sum	3.341 employees	2.422 employees	1.398 employees	234 employees	7.395 employees
Percentage	45,18	32,75	18,91	3,16	

Source: Employee Data December 2021 Bima Regency (data analysis)

The ASN retirement age limit is 58 years for administrative officials, young expert functional officers, first functional experts, and skilled functional officers. As for intermediate functional officials and main expert functional officials, they have a retirement age limit of 60 years and 65 years. Analysis of employee spending was carried out by predicting the number of retired employees during 2022-2026, assuming a retirement age of 58 years and no additional employees. The results showed that 2,413 employees retired in the period, or a decrease of 32.63 percent. Thus, employee spending will also experience almost the same decline. The allocation of funds from the decrease in employee spending can be diverted to infrastructure capital expenditure, goods and services expenditure, or other expenditures, more specifically in the HDI driving sectors.

3.4.2. Public Service Infrastructure Spending

In the explanation of Law Number 1 of 2022, it is stated that public service infrastructure spending is regional infrastructure spending which is directly related to the acceleration of development and/or maintenance of public service facilities oriented towards regional economic development. Infrastructure development is closely related to capital expenditure. Infrastructure spending dominates capital expenditure. The proportion of capital expenditure in local governments is still relatively small compared to operational expenditures in employee expenditures and goods/services.

Bima regency is a part of West Nusa Tenggara Province along with nine other regencies/cities. Bima regency had a total population in 2021 of 520.44 thousand people, with an area of 4,389 km2 or 21.78 percent of the area of West Nusa Tenggara province. The area affects the amount of capital expenditure (Hardiningsih & Wakhidati, 2017). Capital expenditure tends to be carried out for the physical development of the area so that the wider the area is, the greater the development costs are needed. Regional expenditures, capital expenditures, and the area of regencies/cities in the West Nusa Tenggara region can be seen in **Table 2**.

Table 2: Area Size, Regional Expenditure, and Capital Spending of The NTB Region in 2021

(in billion Rupiah)*

Local government	Area size (km2)	Regional expenditure*	Capital spending*	Proportion capital spending
Sumbawa	6.643,98	1.669,71	184,39	11,04
Bima	4.389,40	1.757,04	261,58	14,89
Dompu	2.324,60	912,55	137,60	15,08
Sumbawa Barat	1.894,02	1.007,37	146,86	14,58
Lombok Timur	1.605,55	2.732,61	406,73	14,88
Lombok Tengah	1.208,40	2.118,59	225,85	10,66
Lombok Barat	1.053,87	1.661,84	204,50	12,31
Lombok Utara	809,53	850,53	134,50	15,81
Kota Bima	207,50	716,70	138,38	19,31
Kota Mataram	61,30	1.382,35	185,55	13,42

Source: BPS, Regional Government Financial Report (data analysis)

Table 2 shows that for local governments in the NTB regions, the amount of capital expenditure is not in line with the area. The type of expenditure allocated to each region is greatly influenced by the conditions of each region. The proportion of capital expenditures is also quite far from the proportion of infrastructure spending expected to be fulfilled in the next five years, which is at least 40 percent of regional expenditures.

Bima regency's capital expenditure for the 2016—2021 period shows the value and proportion of capital expenditures experiencing a downward trend. In 2019, there was an increase but followed by a decline in 2020 and 2021. The capital expenditure of the Bima regency government in 2016-2021 can be seen in **Figure 9**.

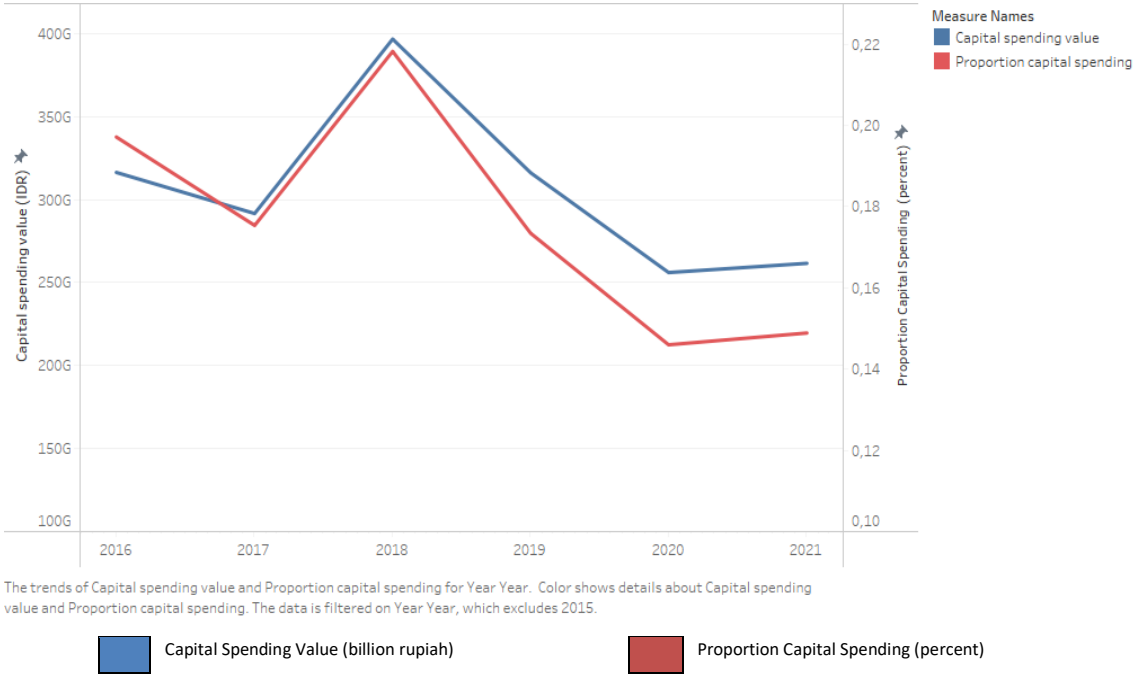


Figure 9. The Capital Expenditure of Bima Regency in 2016-2021
Source: Bima Regency Financial Report (data analysis)

In developing countries, capital expenditure on infrastructure can encourage economic growth compared to spending in the form of goods (Butkiewicz & Yanikkaya, 2007). It is projected that there will be a decrease in the number of Bima regency government employees to reach 32.63 percent in 2026; hence, the funds formerly assigned for employee expenditures can be allocated for other expenditures, including capital expenditures. The addition of capital expenditure allocation is expected to increase regional economic growth for this region.

Conclusions

In the realm of regional development, the Human Development Index (HDI) is set as the main indicator to measure the success of regional development and SDGs. This shows that HDI is an important factor in measuring the success of regional development and the regional SDGs achievements. For this reason, the government needs to pay more attention to regulating the allocation of regional expenditures to empphasize more on sectors that can support the increase in HDI such as education and health. The results of the analysis of regional expenditure efficiency on increasing HDI using a cost-effectiveness analysis conducted based on the HDI increase group (0.34-038) and the regional expenditure value group (Rp.1,400 billion) indicate that the Bima regency is not ready for escalation.

The Human Development Index is still in the moderate category because the Bima regency is still not efficient and effective enough in managing regional expenditures when compared to other regencies in eastern Indonesia, which have experienced an increase in HDI and equivalent regional expenditures. In addition, the forecast results show that the Human Development Index in the next three years (2022-2025) in Bima regency only increases by 0.611 per year, making Bima Regency classified in the medium category. This means that there will be no significant increase in the HDI in Bima in the next three years if Bima regency does not make changes to the structure of the APBD for the strategy to increase HDI.

Recommendations

To escalate the effectiveness and efficiency of regional spending to support the commitment of the Bima regency government in supporting the achievement of SDGs goals, and fulfilling the obligation to fulfill the proportion of employee spending and public service infrastructure expenditure, the local government of Bima regency are suggested to: (1) reduce the proportion of employee spending. ASNs reaching retirement age until 2026 are expected to reach 32.63 percent; thus local governments can offer early retirement schemes to ASNs whose work productivity does not allow them to be increased again and divert employee spending to infrastructure capital expenditure, goods, and services expenditure, or other expenditures—more specifically in the HDI driving sectors; (2) allocate the budget to the HDI driving sector selectively. HDI is influenced by three components, namely, the level of education, health, and a decent standard of living. The allocation of expenditure for education and health in Bima regency in the 2021 APBDP has reached 46.83 percent and 26.74 percent of the total regional expenditure allocation, respectively. Of this amount, more than 85 percent is operational expenditure. The government needs to reduce operational costs by reviewing the use of contract labor, implementing green offices by reducing the use of documents in hard copy form, increasing the use of digital offices, reducing meeting activities outside the office, and increasing cooperation between the government and business entities in the development of public infrastructures such as roads, schools, hospitals, electricity networks, internet networks, and others; (3) evaluate each program and activity and prioritize budget allocation for programs and activities that support the increase of regional development in the following year, such as poverty alleviation, expansion of employment, increasing the capacity of human resources, strengthening productive sectors (infrastructure, agriculture, industry), improving environmental quality, and others. Regional spending policies are prepared annually in the APBD. These policies must run simultaneously so that regional development can achieve the desired goals. The results of the evaluation of regional expenditures can assist the Bima regency government in formulating regional expenditure management policies so that regional development can be achieved effectively and efficiently; (4) enhance the knowledge of regional spending as well as its regulations and implementation procedures by providing training and education to related ASNs, to reduce fraud, overspending, underspending, misspending, and fraudulent spending; (5) intensify the implementation of a merit system in ASN management through the

merit system will encourage ASNs to be more optimal and productive in performance, so that local governments do not need to use additional labor. This effort can save the realization of employee spending; (6) develop public service standards, especially in the fields of education and health, that apply evenly and are well published in all regions of Bima regency; (7) promote equitable development of public service infrastructure facilities in all regions In every aspect, monitoring and evaluation need to be carried out, whether it is carried out by internal regional government supervisors or through surveys of users of public services.

Reference

Alm, J., Aten, R. H., & Bahl, R. (2001). Can Indonesia decentralize successfully? Plans, problems andprospects. *Bulletin of Indonesian Economic Studies*, *37*(1), 83–102. https://doi.org/10.1080/00074910130004653 7

Amalia, F. R., & Purbadharmaja, I. B. P. (2015). Pengaruh kemandirian keuangan daerah dan keserasian alokasi belanja terhadap indeks pembangunan manusia. *E-jurnal Ekonomi Pembangunan Universitas Udayana*, *3*(6), 17–18.

Arriani, R. R., & Chotib. (2021). The Correlation of SDG 1 and 8 and spatial effect of human development index in Central Java. *IOP Conference Series: Earth and Environmental Science*, *940*(1). https://doi.org/10.1088/1755-1315/940/1/012063

Badan Perencanaan Pembangunan Nasional. (2017). *Pedoman penyusunan rencana aksi sdgs 2030 Indonesia*. Kementerian Perencanaan Pembangunan Nasional/ Bappenas. https://www.google.co.id/books/edition/Rencana_Aksi_SDGs_2030_Indonesia/RbYjEAAAQBAJ?hl=id&gbpv=1

Benedek, J., Ivan, K., Török, I., Temerdek, A., & Holobâcă, I. H. (2021). Indicator-based assessment of local and regional progress toward the Sustainable Development Goals (SDGs): An integrated approach from Romania. *Sustainable Development*, *29*(5), 860–875. https://doi.org/10.1002/sd.2180

Butkiewicz, J. L., & Yanikkaya, H. (2007). Time-consistent polities and growth in developing countries: An empirical analysis. *Review of World Economics*, *143*(2), 306–323. https://doi.org/10.1007/s10290-007-0109-9

Effendy, I., Widayati, Q., & Sepriyansyah, R. (2021). Pemanfaatan software tableau dalam pembuatan dashboard bencana karhutla di BPBD Sumatera Selatan. *JPKMBD (Jurnal Pengabdian Kepada Masyarakat Bina Darma)*, *1*(2), 132–141. https://journal.binadarma.ac.id/index.php/pengabdian/article/view/1449/799

Fattah, S. (2012). Local government expenditure allocation toward human development index at Jeneponto Regency, South Sulawesi, Indonesia. *IOSR Journal of Humanities and Social Science*, *5*(6), 40–50. https://doi.org/10.9790/0837-0564050

Ferraz, D., Mariano, E. B., Rebelatto, D., & Hartmann, D. (2020). Linking human development and the financial responsibility of regions: combined index proposals using methods from data envelopment analysis. *Social Indicators Research*, *150*(2). https://doi.org/10.1007/s11205-020-02338-3

Hadi, S. (2011). Analisis determinan belanja daerah di kabupaten/kota Provinsi Jawa Barat dalam era otonomi dan desentralisasi fiskal. *Jurnal Bisnis dan* Ekonomi, *18*(1), 46–58.

Hall, D. (2014). *Why we need public spending*. Public Services International University of Greenwich.

Handayani, R., Soleh, A., Santoso, A., & Rahayu, Y. (2022). Analisis kausalitas belanja modal, bantuan sosial dan indeks pembangunan manusia. *Jurnal Manajemen dan Sains*, *7*(1), 264–269. https://doi.org/10.33087/jmas.v7i1.368

Hardiningsih, A. P., & Wakhidati, I. N. (2017). Karakteristik daerah terhadap belanja modal dengan pemoderasi pertumbuhan ekonomi. *Dinamika Akuntansi, Keuangan Dan Perbankan*, *6*(1), 53–66.

Haryanto, J. T. (2015). Studi ecological fiscal transfer sebagai potensi pendanaan lingkungan di daerah. *Jurnal Ilmu Sosial Dan Ilmu Politik*, *18*(3), 252–266.

Hyndman, R., & Athanasopoulos, G. (2018). *Forecasting principles and practice. OTEXTS*.

Jain, P., & Jain, P. (2020). Are the sustainable development goals really sustainable? A policy perspective. *Sustainable Development*, *28*(6), 1642–1651. https://doi.org/10.1002/sd.2112

Jantsch, E. (1970). From forecasting and planning to policy sciences. *Policy Sciences*, *1*(1), 31–47. https://doi.org/10.1007/BF00145191

Jaya, A. H. (2021). The effect of economic growth and government expenditure on human development in Palu City. *Jurnal Mantik*, *4*, 2715–2721.

Karianga, H. (2017). *Carut marut pengeloaan keuangan daerah di era otonomi daerah* (p. 242). Kencana.

Kharas, H., & Mcarthur, J. (2019). *Building the SDG economy*. Global Economy & Development.

Knowlton, L. W., & Phillips, C. C. (2013). *The logic model guidebook: Better strategies for great results* (2nd ed.). Sage.

Krismanjaya, I., & Dewi, N. (2019). Pengaruh belanja daerah dan investasi terhadap kesejahteraan masyarakat melalui pertumbuhan ekonomi pada Kabupaten Kota Provinsi Bali. *E-Jurnal Ekonomi Pembangunan Universitas Udayana*, *8*(6), 1390–1442.

Kusumasari, B., Munajat, E., & Zul, F. (2022). Measuring global pandemic governance : How countries. *Journal of Management and Governance*. https://doi.org/10.1007/s10997-022-09647-4

Martinidis, G., Komninos, N., & Carayannis, E. (2022). Taking into account the human factor in regional innovation systems and policies. *Journal of the Knowledge Economy*, *13*(2), 849–879. https://doi.org/10.1007/s13132-021-00722-z

Masduki, U., Rindayati, W., & Mulatsih, S. (2021). Spending quality and development performance: Evidence from less developmeny regions. *Jurnal Ekonomi Dan Pembangunan*, *29*(2), 167–182. https://doi.org/10.14203/JEP.29.2.2021.167-182

Muliza, M., Zulham, T., & Seftarita, C. (2017). Analisis pengaruh belanja pendidikan, belanja kesehatan, tingkat kemiskinan dan PDRB terhadap IPM di Provinsi Aceh. *Jurnal Perspektif Ekonomi Darussalam*, *3*(1), 51–69. https://doi.org/10.24815/jped.v3i1.6993

Nababan, A. A. (2020). Analisis pengaruh belanja daerah, jumlah pengangguran, dan indeks pembangunan manusia (IPM) terhadap jumlah penduduk miskin di Kabupaten Labuhanbatu tahun 2006-2017. *Repository Universitas HKBP Nommensen*.

Ningrum, E. W., & Nuryadin, M. (2021). Pengaruh belanja daerah terhadap pertumbuhan ekonomi, ipm, dan kemiskinana di Kalimantan Selatan. *Jurnal Ilmu Ekonomi dan Pembangunan*, *4*(1), 9–25.

Paliova I., McNown, R., Nulle. G. (2019). *Multiple dimensions of human development index and public social spending for sustainable development*. International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2019/09/26/Multiple-Dimensions-of-Human-Development-Index-and-Public-Social-Spending-for-Sustainable-48610

Patton, M. Q. (2002). *Qualitative research and evaluation methods*. SAGE Publications Inc.

Priambodo, A., & Noor, I. (2016). Analisis pengaruh belanja pemerintah daerah terhadap indeks pembangunan manusia (Studi pada Kabupaten/Kota di Pulau Jawa tahun 2007-2013). *Jurnal Ilmiah Mahasiswa FEB*, *3*(2).

Rahmawati, F., Ananda, F. P., & Narmaditya, B. S. (2020). Socio-economic indicators and income inequality: Lesson from west Java in Indonesia. *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration*, *28*(3). https://doi.org/10.46585/sp28031114

Raya, M. (2021). Analisis pengaruh belanja daerah dan indeks pembangunan manusia terhadap pertumbuhan ekonomi kabupaten dan kota di Bolaang Mongondow Raya. *Jurnal Ekonomi Pembangunan dan Keuangan Daerah*, *22*(3), 75–95.

Requejo-Castro, D., Giné-Garriga, R., & Pérez-Foguet, A. (2020). Data-driven Bayesian network modelling to explore the relationships between SDG 6 and the 2030 Agenda. *Science of the Total Environment*, *710*, 136014. https://doi.org/10.1016/j.scitotenv.2019.136014

Rosmadayanti, D., Imaningsih, N., & Wijaya, R. S. (2021). Pengaruh pertumbuhan ekonomi, pendapatan asli daerah, dana alokasi khusus dan belanja daerah terhadap indeks pembangunan manusia di Jawa Timur. *Jurnal Syntax Admiration*, *2*(8), 2722–5356. https://doi.org/10.46799/jsa.v2i8.284

Rossi, P. H., Lipsey, M. W., & Freeman, H. E. (2004). *Evaluation a systematic approach*. SAGE Publications Inc. https://doi.org/10.1016/0738-0593(82)90010-4

Rustariyuni, S. D. (2014). Pengaruh gini ratio, pengeluaran non makanan per kapita, belanja daerah dan laju pertumbuhan ekonomi pada indeks pembangunan manusia Kabupaten/Kota di Provinsi Bali Periode 2004-2012. *Piramida*, *10*(1), 45–55.

Sari, Y., Winarni, E., & Amali, M. (2021). Analisis kausalitas pertumbuhan ekonomi, indeks pembangunan manusia dan belanja modal di Provinsi Jambi. *Ekonomis: Journal of Economics and Business*, *5*(2), 565–571.

Sari, I. A. C. Y., & Supadmi, N. L. (2016). Pengaruh pendapatan asli daerah dan belanja modal pada peningkatan indeks pembangunan manusia. *Jurnal Akuntansi Universitas Udayana*, *15*, 2409–2438.

Sippa, F., & Saleh, M. (2021). Analisis pengaruh belanja daerah bidang pendidikan, bidang kesehatan dan bidang infrastruktur tehradap indeks pembangunan manusia di Kabupaten Hulu Sungai Utara tahun 2003-2015. *Jurnal Ilmu Ekonomi dan Pembangunan*, *4*(2).

Sisto, R., López, J. G., Quintanilla, A., de Juanes, Á., Mendoza, D., Lumbreras, J., & Mataix, C. (2020). Quantitative analysis of the impact of public policies on the sustainable development goals through budget allocation and indicators. *Sustainability (Switzerland)*, *12*(24), 1–15. https://doi.org/10.3390/su122410583

Bandiyono, A. (2018). Pengaruh belanja pemerintah daerah berdasarkan fungsi terhadap peningkatan IPM dan pengentasan kemiskinan (studi pada Kabupaten/Kota di Provinsi Aceh). *Jurnal Info Artha*, *2*(1), 11–28.

United Nations Development. (2020). *Human development and the SDGs | human development reports*. http://hdr.undp.org/en/content/human-development-and-sdgs

Williantara, G. F., & Budiasih, G. A. N. (2016). Pengaruh pendapatan asli daerah, dana alokasi umum, dana alokasi khusus, dan dana bagi hasil pada indeks pembangunan manusia. *E-jurnal Akutansi Universitas Udayana*, *16*(3), 2044–2070.

World Bank. (2020). *Indonesia public expenditure review (per) 2020 : Spending for better results*.

Zulyanto. (2016). Pengeluaran pemerintah dan indeks pembangunan manusia di Provinsi Bengkulu. *Jurnal Ekonomi-Qu*, *6*(2), 115–139. http://dx.doi.org/10.35448/jequ.v6i2.4340

Zuraida, R. (2017). Pengaruh pertumbuhan ekonomi, pendapatan asli daerah dan belanja daerah terhadap indeks pembangunan manusia. *eProceedings Management*, *5*(2), 773–783. https://doi.org/10.3969/j.issn.1001-1242.2017.07.028

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 2 – August 2022

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Policy Paper

Low Carbon Emission Shrimp Farming Development Model

M. Rifqi[1*], Rokhmad M Rofiq[1], Andi Rahman[2], Rizna Ayu Wardhana[1], Fitrina Nazar[3]

Secretariate Directorate General of Aquaculture, Ministry of Marine Affairs and Fisheries, Jakarta, Indonesia[1]
Directorate of Aquaculture Areas and Fish Health, Directorate General of Aquaculture, Ministry of Marine Affairs and Fisheries, Jakarta, Indonesia[2]
Jakarta Technical University of Fisheries, Pasar Minggu, South Jakarta 12520, Indonesia[3]

*)Corresponding authors: mrifqi1975@gmail.com

ABSTRACT

Shrimp is a vastly strategic aquaculture commodity in Indonesia, most of which is produced for the export market; hence, competitiveness is the main key in the industry. With the increasing productivity of a shrimp farming area, the regulation for establishing a shrimp culture area needs to be strictly managed, including reducing carbon emissions. The management of aquaculture areas needs to pay attention to the principle of sustainability and consider carbon dynamics. This paper contains a descriptive analysis of the literature related to the substance of the study. The carbon dynamics in aquaculture areas consist of potential sources of carbon emitted and potential sinks or carbon that can be absorbed and stored. By structuring the shrimp pond area, aquaculture engineering, the application of good aquaculture practices and use of alternative energy sources, during the shrimp farming process in ponds, the carbon emission can be minimized, and the carbon sink can be increased. Our recommendation suggests that analysis of land suitability, environmental carrying capacity and carbon dynamics in each shrimp pond area are exceptionally required to be conducted to assess land suitability as a low carbon emission shrimp farming area. Furthermore, to increase farmers' understanding and awareness of the sustainability of the practices, pilot areas for low-emission shrimp ponds need to be developed.

Keywords: Green Production; Mitigation; Greenhouse Gases

ARTICLE INFO

Received: June 28, 2022
Received in revised form: August 5, 2022
Accepted: August, 31, 2022
doi: 10.46456/jisdep.v3i2.307

JISDeP - The Journal of Indonesia Sustainable Development Planning
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail:
journal.pusbindiklatren@bappenas.go.id

Supported by Indonesian Development Planners Association (PPPI)

1. Introduction

The development of aquaculture, including shrimp farming, is part of the national development of the marine and fisheries sector. Indonesia's long-term development goal stated in Law no. 17 of 2007 is to realize a beautiful and sustainable Indonesia. This is in line with the global development goals as stated in the Sustainable Development Goals (SDGs) that have been agreed upon by the nations. The integration of the SDGs into the national development plan is expected to realize economic growth and social welfare along with minimizing environmental impacts and reducing Green House Gas (GHG) emissions. Most of the SDG's targets are relevant to the development of aquaculture. In its implementation, the Ecological Aquaculture Approach (EAA) contributes significantly to the achievement of the 17 SDGs goals (Hambrey, 2017).

Shrimp farming in aquaculture development centers has developed into the main livelihood of coastal communities and supports regional and national economies. The huge profits from the shrimp farming business have attracted the public interest, business actors and the private sector. However, not all aquaculture areas have a structuring concept, and not all spatial uses are followed by effective supervision and control. For example, the utilization of the coastal area of Karawang Regency for aquaculture areas has exceeded the allocation for land use in spatial planning, some of which have even converted mangroves (Komarudin, 2013). The shrimp production in Karawang District in 2018 was 11,374.08 tons, which was still 81.22% of the environmental carrying capacity (14,003.83 tons a year^{-1}) (Rifqi, Widigdo, ashar, Nazar, & Wardianto, 2020), so that the Karawang Regency shrimp production target could still be increased (Rifqi, 2020). To date, the target increase has not been officially set; however, achieving such a target cannot be done by increasing the total area of aquaculture but by increasing productivity and cultivation technology on land designated for cultivation areas (Rifqi et al., 2022).

The development of aquaculture areas in order to achieve production targets, needs to pay attention to the principles of sustainability, including considering the dynamics of carbon. Sustainability of shrimp farming in an aquaculture area includes aspects of structuring and utilizing land according to its designation and considering the carrying capacity of the environment (Rifqi, Widigdo, Mashar, Nazar, & Wardiatno, 2020); considering carbon dynamics (Rifqi et al., 2022); mitigation of negative impacts on the environment (Páez-Osuna, 2001), adaptability to climate change (Ahmed et al., 2019; Food and Agriculture Organization of the United Nations [FAO], 2020), and effective communication and education of stakeholders (Xuan et al., 2021).

Karawang Regency is one of the centres of shrimp farming area in Indonesia. The total area of aquaculture in the coastal area of Karawang Regency is currently 14,411.30 ha consisting of 1,440.00 ha of intensive and semi-intensive ponds and 12,971.30 ha of extensive ponds (District Fisheries Services [DFS], 2018). The number of shrimp farmers in Karawang Regency is 3,391.00 fisheries households (RTP), consisting of: 97.05% extensive technology farmers, 1.47% semi-intensive, 1.47% intensive (processed from DFS, 2018). The average production of traditional ponds is 0.26 tons Ha^{-1}, semi-intensive ponds 5.79 tons Ha^{-1} and intensive ponds 15.62 tons Ha^{-1} (Processed from DFS, 2018). The ideal land productivity for shrimp farming is 0.5-1 ton ha^{-1} in extensive ponds (SNI 7310:2009), 9 tons ha^{-1} for semi-intensive ponds (SNI 8007:2014), 20 tons ha^{-1} for intensive ponds (SNI 01-7246.1-2006). The aquaculture areas are spread over 9 (nine) sub-districts on the coastal area of Karawang Regency, namely: Pakisjaya, Batujaya, Tirtajaya, Cibuaya, Pedes, Cilebar, Tempuran, Cilamaya Kulon and Cilamaya Wetan.

Based on the current level of land use and the performance of shrimp farming on the coast of Karawang Regency as well as the dynamics of carbon related to shrimp farming in ponds, the potential for carbon emissions, carbon sequestration, and stocking potential in the area can be estimated (Rifqi, 2020). Structuring aquaculture areas is an integral part of integrated coastal management because the coastal ecosystem consists of natural and artificial components, dynamic and complex, as well as diverse and interacting habitats (Dahuri et al., 1996). Integrated coastal management can be harmonized between activities and users in utilizing resources in the region.

Arrangement of aquaculture areas that is carried out on land in accordance with the designation of spatial planning and supported by improved aquaculture technology can optimize carbon management. Moreover, the land designated as a mangrove protected area also needs to be restored to its function. Although its utilization for shrimp farming is limited, the land utilization must be in accordance with the recommended technology. Restoration of the mangrove ecosystem on the coast of Karawang Regency

will positively impact the continuity and sustainability of shrimp farming in ponds while restoring environmental services (including carbon sinks and stocks).

2. Methodology

This study used a descriptive analysis of data and information from published research and studies to develop a conceptual framework for structuring a low-carbon shrimp pond area. The research location is a shrimp pond area on the coast of Karawang Regency, as shown in Figure 1. We synthesized 46 articles from ScienceDirect and Google Scholar journal databases as well as 11 books and reports in this literature review paper. The search strategy was carried out using keywords: the impact of climate change on shrimp farming, blue carbon emissions in shrimp areas, and blue carbon sequestration stored in shrimp areas. Meta-aggregation could be used for the systematic review of qualitative approach to present comprehensive and balanced facts to policymakers (Siswanto, 2010).

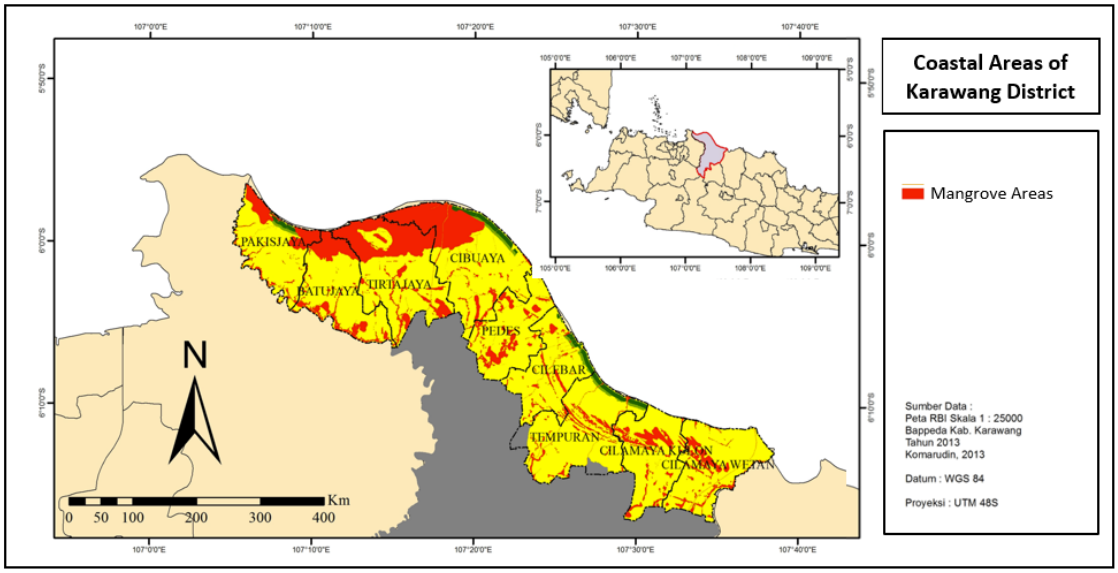


Figure 1. Coastal areas of Karawang District

The meta-aggregation synthesis process, as stated by Siswanto (2010), which was also carried out in this study, includes (i) extracted themes and concepts from relevant studies, (ii) organizing the results of this extraction into important (main) findings, (iii) grouped the findings into categories, (iv) synthesized the categories into themes or adapted to the conceptual framework. The approach and methods used in this paper are believed to be able to make this policy brief actionable.

The desk research results in this study were supported by experience and field observations. Field observations were carried out to examine the problems studied (Sugiyono, 2008). Documents used as desk study materials include research results, reports, planning documents, Indonesian National Standards (SNI) and regulations/laws.

3. Results and Discussions

Environmental aspects determine the success of the production and business continuity of aquaculture activities and, on the other hand, determine the acceptability and competitiveness of products in the global market. Increasing aquaculture production must be carried out in an environmentally friendly manner to minimize environmental costs (Hall et al., 2011). To minimize the impact on ecosystems in an area, sustainable pond management with mangrove conservation is needed (Fawzi & Husna, 2021). The main challenge of aquaculture governance is determining effective measures to ensure environmental sustainability along with building entrepreneurship and social harmony. The

emphasis on spatial planning developed as part of the Ecosystem Approach to Aquaculture (EAA) will bring EAA closer to blue growth (Brugère et al., 2019). Ecosystem approaches to aquaculture, climate change, habitat restoration, protected areas and passive species regulation and control are part of the blue growth initiative (Moffitt & Cajas-Cano, 2014).

The agreement of the nations on the Sustainable Development Goals (SDGs) sets Climate Action as the 13th agenda. The approach taken is low-carbon and climate-resilient development to mitigate climate change and minimize the risk of other environmental damage impacts, as stated in the National Medium-Term Development Plan (RPJMN) of 2020-2024. Carbon trading mechanisms have been widely developed in the form of the regulated market (cap and market scheme) and voluntary carbon market (Ullman et al., 2013). Presidential Regulation Number 98 of 2021 indicates that Indonesia's carbon policy is carried out using market-based instruments.

The majority of papers available today only addressed the emission of carbon and other greenhouse gases in the aquaculture industry due to the shrimp farming process. Yang, Bastviken, et al. (2017) and Tong et al. (2021) concluded that shrimp farming activities in ponds contribute to greenhouse gas emissions, especially in ponds that convert mangrove land (Kauffman et al., 2017). The accumulation of carbon and other greenhouse gas (GHG) emissions, especially CO_2, CH_4, and N_2O, has triggered global climate change (Griggs & Noguer, 2002). The linkages between shrimp farms area, carbon emissions and climate change are shown in Figure 1.

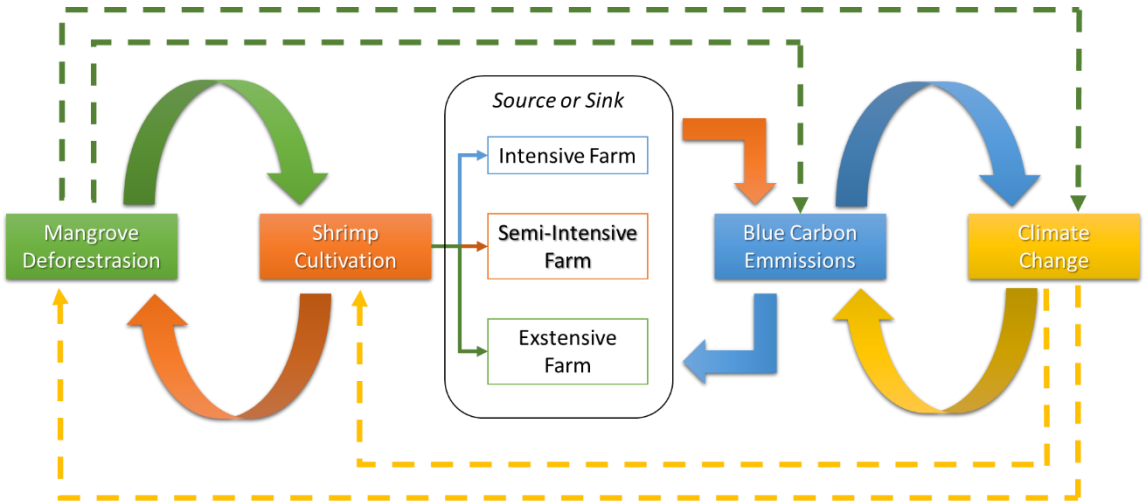


Figure 1. Backward and forward linkage of shrimp farming area and climate change (modified from Ahmed et al., 2017)

The carbon stock of mangrove ecosystems converted to aquaculture areas decreased to 81.9 Mg C ha^{-1} or 50% of the natural mangrove carbon stock (Merecí-Guamán et al., 2021). Kauffman et al. (2017) concluded that shrimp farming by converting mangroves and extensive technology (productivity of about 250 kg ha^{-1}) in the Mahakam Delta caused emissions of 1,603 kg CO_2-equivalent for every 1 kg of shrimp produced. There are potential emissions and releases of carbon elements by shrimp ponds that convert mangroves, i.e. from the basic substrate of mangrove ecosystems (Alongi et al., 2016; Kauffman et al., 2014; Liu et al., 2014; Siikamäki et al., 2013); the loss of the ability of mangroves to absorb CO_2 (Chen et al., 2016; Heriyanto & Subiandono, 2012; Rahman et al., 2017; Sondak, 2015)(and the loss of carbon stocks in the form of biomass (Alongi et al., 2016; Hilmi et al., 2017; Liu et al., 2014; Murdiyarso et al., 2015; Rachmawati et al., 2014; Rahman et al., 2017; Siikamäki et al., 2013). And also, there are potential emissions of CO_2 (Rifqi, Widigdo, Mashar, & Wardiatno, 2020; Rifqi, Widigdo, Wardiatno et al., 2020; Arifanti et al., 2021), CH_4 (Rifqi, Widigdo, Mashar, & Wardiatno, 2020; Rifqi, Widigdo, Wardiatno et al., 2020) and N_2O (Yogev et al., 2018) during the shrimp farming process in ponds.

The amount of emission per kg of shrimp produced will probably certainly be much lower on land that does not convert mangroves and have better land productivity, such as in semi-intensive and intensive ponds. However, there are still limited studies that explain the potential for carbon uptake and

storage during the shrimp farming process in aquaculture. Furthermore, there is a potential for carbon absorption by phytoplankton and carbon stocks in the form of phytoplankton and shrimp/fish biomass (Widigdo et al., 2020).

Table 1: List of potential dynamics of blue carbon in shrimp farming area

No.	Items	Sources
a.	**Potential of Sources or carbon emitted**	
1.	Land conversion	
	- Loss of mangrove biomass	Hilmi et al., 2017
	- Loss of mangrove absorption capability	Chen et al., 2016; Rahman et al., 2017
2.	Emissions during shrimp farming)	Dewata, 2013; Rifqi, Widigdo, Mashar, & Wardiatno, 2020; Rifqi, Widigdo, Wardiatno et al., 2020
3.	Emissions when ponds are drained	Sidik & Lovelock, 2013; Yang, Lai et al., 2017
4.	Increased emissions of coastal natural ecosystems that exposure to the pond's effluent	Queiroz et al., 2019; Pérez et al., 2020
b.	**Potential of Sinks or carbon that can be absorbed and stored**	
1.	Carbon absorption by phytoplankton	Chen et al., 2017; Reeder, 2017; Vallina et al., 2017; Widigdo et al., 2020
2.	Carbon storage in the form of phytoplankton biomass and aquatic organisms	Hill et al., 2015; Mitra & Zaman, 2015; Widigdo et al., 2020

Estimation of GHG emissions during shrimp farming in ponds is the key to predicting the impact of shrimp farming on global warming (Vasanth et al., 2016). Efforts to reduce GHG emissions are related to the continuity and sustainability of aquaculture, including shrimp farming in the pond itself (Ahmed & Diana, 2015). Because climate change decreases survival and growth rates and reduces the production of shrimp reared in ponds (Ahmed & Diana, 2015; Ahmed et al., 2019). Efforts to mitigate greenhouse gas emissions in aquaculture areas include controlling emission sources through structuring the area, aquaculture engineering technology, using alternative energy sources, and increasing carbon sequestration and storage.

Table 2: Dynamics of blue carbon on three differences of shrimp farming technology

No.	Items	Extensive	Semi-Intensive	Intensive
a.	***Source* (ton Ha^{-1})**			
1.	Gas emission from substrate[1)]	673.00	673.00	673.00
2.	Loss of CO_2 absorption capacity [2)]	150.19	150.19	150.19
3.	Loss of carbon stock[3)]	160.70	160.70	160.70
4.	CO_2 emission during shrimp culture[4)]	0.97	66.39	91.59
5.	CH_4 emission during shrimp culture [4)]	0.0017	0.0007	0.0006
b.	***Sink* (ton Ha^{-1})**			
1.	Carbon absorption[5)]	0.71	7.81	9.08
2.	Carbon stock[5)]	0.0071	0.16	0.27

Source:
[1)] = modified from Kauffman et al., 2014; Liu et al., 2014; Siikamäki et al., 2013.
[2)] = modified from Chen et al., 2016; Rahman et al., 2017.
[3)] = modified from Hilmi et al., 2017.
[4)] = Rifqi, Widigdo, Mashar, and Wardiatno, 2020.
[5)] = Widigdo et al., 2020.

Utilization of aquaculture areas on the coast of Karawang Regency as aquaculture areas with low carbon emissions can be formulated by considering: (1) the carbon dynamics of each cultivation

technology (extensive, semi-intensive and intensive), (2) socio-economic conditions such as the income of shrimp farmer, and (3) the area of ponds that meets with the designation and does not exceed the carrying capacity. The results of the study on the carbon dynamics in existing aquaculture areas can scientifically explain the mitigation efforts that can be done. Kauffman et al. (2014), Liu et al. (2014), Siikamäki et al. (2013), and Rifqi, Widigdo, Mashar, and Wardiatno (2020) described the potential for emissions, while Widigdo et al. (2020) explained the potential for carbon sequestration and storage at various levels of aquaculture technology, namely: extensive, semi-intensive and intensive.

Scenario analysis was used by Rifqi (2020) to design blue growth and low carbon emissions in the Karawang Regency shrimp farming area. The main principle of blue carbon management is to reduce and minimize emissions and increase the carbon sink. Rationalization of shrimp farming area on the coast of Karawang Regency can reduce carbon emissions and increase the ability to absorb CO_2 and carbon stocks Rifqi et al. (2022). This study suggested that the existence of mangrove protected areas in a spatial pattern will provide environmental services, including absorbing and storing carbon, filtering and absorbing organic matter from pond effluent, and also will increase the carrying capacity of the environment to support the continuity and sustainability of shrimp farming activities in the area. Moreover, aquaculture activities' productivity in coastal regions with mangrove protected areas can also be increased. Achieving the target of pond production can be done by increasing the area and productivity of semi-intensive and intensive ponds. As for traditional ponds, production targets can be optimized by producing commodities other than shrimp such as seaweed and fish.

Carbon dynamics are integrated with the results of land suitability analysis, environmental carrying capacity and socio-economic studies of the community to develop a representative, applicable and science-based management plan. The principle of blue carbon is to reduce emissions and increase the sinks. Based on potential emissions, climate change mitigation efforts in aquaculture areas can be carried out through (1) efficiency of energy use and use of alternative energy sources during the aquaculture process; (2) optimization of water quality management during the aquaculture process, including optimizing the population and composition of phytoplankton; (3) effluent management; (4) keeping the ponds inundated during the non-production phase; (5) enforcement of spatial utilization regulations, and (6) waste management in aquaculture areas.

a. Efficient use of energy and use of alternative energy

In addition to emissions from land conversion, the greatest potential for carbon emissions during the shrimp farming process is the conversion from energy consumption Rifqi (2020). This study learned that the highest energy consumption in shrimp farming in ponds is for paddlewheels, water pumps and lighting. Energy consumption efficiency can be done by assessing the ideal number of paddlewheels that need to be operated at certain hours by considering dissolved oxygen saturation and efficient water replacement frequency and volume. Efficient use of energy can also have an impact on reducing operating costs and increasing production efficiency.

Efficiency in energy use and the use of alternative energy sources during the shrimp farming process, among others, through the conversion of the use of electrical energy and fuel to alternative renewable energy sources such as wind power and solar cells. The current condition of investment and maintenance costs for solar cell facilities and wind power drives is still relatively high, so it is not feasible to analyze it with direct economic value. In the future, business analysis calculations need to use the total economic value that takes into account the carbon price. Along with the increasing use of alternative energy sources in various sectors, it is expected that the investment and maintenance costs will decrease.

b. Optimization of water quality management

Optimal water quality parameters during rearing will support the survival and growth of shrimp. At the same time, water quality affects the population and composition of phytoplankton as well as potential carbon emissions. The population and composition of phytoplankton in shrimp ponds contribute to carbon sequestration and storage (Widigdo et al., 2020). Water quality parameters are also related to potential carbon emissions (Rifqi, Widigdo, Mashar, & Wardiatno, 2020; Rifqi, Widigdo, Wardiatno et al., 2020) through biological processes (Setyanto, 2008).

There is a relationship between the accuracy of the development and management of shrimp ponds and GHG emissions, especially CO_2 and CH_4 (Yang et al., 2019). The rate of release of these two GHGs into the atmosphere is influenced by photosynthetic activity and organic matter decomposer microorganisms in the water column (Dariah et al., 2011), so the water quality parameters that influence these two factors determine the potential for emissions.

GHG released into the air partly depends on the physical structure of the water body, which is influenced by physical factors such as temperature, oxygen content, microbial population and metabolic pathways (Laurion et al., 2010). An increase in water temperature causes an increase in the mobility of gas molecules that makes the gas escape from the water (Segers, 1998). Water quality parameters that significantly affect surface water CO_2 emissions are concentrations CO_2 in the air, water temperature, chlorophyll-a, NO_2- and PO_4. Variables that significantly affect the surface CH_4 of semi-intensive pond water are pH and NO_2- (Rifqi, Widigdo, Mashar, & Wardiatno, 2020)

c. Pond effluent management

The management of shrimp pond effluent at the waste treatment installation is important, because it can minimize the potential for carbon emissions from waters and coastal ecosystems around the pond area. Emissions of ecosystems exposed to effluent runoff are higher than the natural emissions of these ecosystems (Queiroz et al., 2019; Pérez et al., 2020).

The management of pond effluent is included in one of the implementations of the Integrated Multi Trophic Aquaculture (IMTA) model. Pond effluent contains high organic matter, so it needs to be treated first before being discharged into coastal waters to avoid eutrophication. Effluent management is carried out in a waste treatment unit or installation which can be in the form of a reservoir and a mechanical method of zigzag ponds in the sewer. The application of IMTA in aquaculture areas allows for two advantages, utilizing organic waste as biomass for low-level trophic organisms and having an economic value such as seaweed, shellfish and fish.

d. Inundation of earthen ponds during the non-production phase

Embankments and pond bottoms that are exposed to air and sunlight during the tillage process have the potential to generate CO_2 emissions (Sidik & Lovelock, 2013). Non-flooded earthen ponds between cycles or are not producing have the potential for higher CO_2, CH_4 and N_2O emissions than ponds that are inundated (Yang, Lai et al., 2017).

To reduce potential GHG emissions from aquaculture areas, especially in earthen pond areas, one way that can be done is to inundate the idle ponds between periods/production cycles. Until now, no information has been obtained about the potential for GHG emissions in plastic lining ponds as long as they are not in production and are not inundated.

e. Law enforcement

The greatest potential for GHG emissions in aquaculture areas is from land conversion, especially those that convert mangroves. Thus, the enforcement of laws and regulations related to land use is very strategic in an effort to mitigate GHG emissions from aquaculture areas. Shrimp farming activities in ponds are carried out on according to the designation in the spatial plan.

Enforcement of regulations and restoration of the function of protected areas such as mangroves can increase carbon sequestration and storage in coastal ecosystems. At the same time, consistent law enforcement can also minimize habitat degradation and environmental damage. Effective law enforcement requires cooperation between the government, shrimp farmer associations, community and religious leaders, as well as business actors and the private sector.

The coastal land area of Karawang Regency, which is physically suitable with the spatial pattern for ponds with extensive technology as well as semi-intensive and intensive technology, is 1,299.99 ha and 1,667.91 Ha for the S1 category (very suitable) and S2 (suitable), (Rifqi, Widigdo, Mashar, Nazar, & Wardiatno, 2020). The coastal waters of this area are able to accommodate production of 14,003.83 tons per year-1 (Rifqi, Widigdo, Mashar, Nazar, & Wardiatno, 2020).

f. Waste management

Waste is one of the sectors targeted for GHG emission reduction, as stated in the National Determination Contribution (NDC). To reduce the potential for GHG emissions from aquaculture areas, waste treatment is one of the efforts that can be done. The higher the technology applied and the more businesses operating in an area, the problems related to waste also increase.

Until now, not all shrimp farming areas have paid attention to waste management. For this reason, in the future, stakeholders need to seek waste management in aquaculture areas. The management concept that can be applied is the 4Rs, namely Replace, Reduce, Reuse, and Recycle. The simplest thing that needs to be implemented is sorting and selecting waste so that it can be separated between organic and inorganic waste.

Optimizing the use of aquaculture in coastal areas can be done by rationalizing the pond area and simultaneously trying to restore mangrove forests or reforestation in protected areas and plant mangroves in possible pond clusters. Coastal management is an effort to optimize and synergize the use of existing resources in a sustainable manner and harmonize activities between users and ecological and economic relationships. Efforts to manage and protect coastal ecosystems from minimizing economic losses by maintaining their sequestration and carbon storage capabilities are urgent and important to do (Alongi, 2018). As part of the coastal ecosystem, future management of aquaculture areas needs to be carried out by considering the dynamics of blue carbon. Especially aquaculture areas that convert mangroves because they are related to carbon sequestration and storage and the resilience and capacity of ecosystem protection against climate-induced disasters (Arifanti, 2020).

Conclusions

Although shrimp farming is very profitable from an economic and business perspective, there is a lot of evidence showing that increased productivity in shrimp farming areas contributes to an increase in carbon emissions and greenhouse gas emissions. Therefore, to develop sustainable shrimp farming, it is necessary to arrange the shrimp farming area according to its designation and consider important factors in its management. Mitigation efforts should also be conducted in order to follow the principle of blue carbon in the aquaculture sector.

In conclusion, to develop a low carbon emission shrimp farm area model, the designated area should be prepared by considering land suitability, environmental carrying capacity and carbon dynamics. The highest emission sources in aquaculture areas include: the conversion of ex-mangrove land into pond plots, energy consumption, and potential emissions during shrimp farming and ponds not operating. Enforcement of spatial use regulations, together with efforts to increase land productivity, can increase aquaculture production in aquaculture areas with low emissions.

The use of low emission alternative energy and aquaculture engineering can minimize sources and increase sinks in aquaculture areas. Restoring the function of the mangrove protected area will provide environmental services, including carbon sequestration and storage as well as support for the continuity and sustainability of the aquaculture area itself.

Recommendations

Based on the results of the analysis, the following recommendations should be considered to address the root issues: (1). It is necessary to analyze land suitability, environmental carrying capacity and carbon dynamics in each shrimp farming area. (2). Achievement of shrimp production targets by increasing shrimp ponds productivity so that the use of land resources becomes efficient. (3). It is necessary to engineer aquaculture technology for efficient use of energy. (4). It requires support for the development of science and knowledge to provide alternative energy sources for shrimp farming. (5). Extension materials and technical guidance related to carbon emissions and their relation to the sustainability of shrimp farming need to be strengthened. (6). Pilot areas of low-emission shrimp farms are needed to increase farmers' understanding and awareness of sustainability. (7). Further study is required, particularly that aims to explain the differences in potential GHG emissions of plastics lining

ponds and earthen ponds when they are flooded and not, potential emissions in ponds that use alternative energy and the efficiency of energy use.

References

Ahmed, N., Cheung, W. W. L., Thompson, S., & Glaser, M. (2017). Solutions to blue carbon emissions: Shrimp cultivation, mangrove deforestation and climate change in coastal Bangladesh. *Marine Policy*, *82*(May), 68–75. https://doi.org/10.1016/j.marpol.2017.05.007

Ahmed, N., & Diana, J. S. (2015). Threatening "white gold": Impacts of climate change on shrimp farming in coastal Bangladesh. *Ocean and Coastal Management*, *114*, 42–52. https://doi.org/10.1016/j.ocecoaman.2015.06.008

Ahmed, N., Thompson, S., & Glaser, M. (2019). Global aquaculture productivity, environmental sustainability, and climate change adaptability. *Environmental Management*, *63*(2), 159–172. https://doi.org/10.1007/s00267-018-1117-3

Alongi, D. M., Murdiyarso, D., Fourqurean, J. W., Kauffman, J. B., Hutahaean, A., Crooks, S., Lovelock, C. E., Howard, J., Herr, D., Fortes, M., Pidgeon, E., & Wagey, T. (2016). Indonesia's blue carbon: a globally significant and vulnerable sink for seagrass and mangrove carbon. *Wetlands Ecology and Management*, *24*(1), 3–13. https://doi.org/10.1007/s11273-015-9446-y

Alongi, D. M. (2018). *Blue carbon: Coastal sequestration for climate change mitigation*. Springer. https://doi.org/doi.org/10.1007/978-3-319-91698-9

Arifanti, V. B. (2020). Mangrove management and climate change: A review in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *487*(1). https://doi.org/10.1088/1755-1315/487/1/012022

Arifanti, V. B., Novita, N., Subarno, & Tosiani, A. (2021). Mangrove deforestation and CO2emissions in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *874*(1). https://doi.org/10.1088/1755-1315/874/1/012006

Brugère, C., Aguilar-Manjarrez, J., Beveridge, M. C. M., & Soto, D. (2019). The ecosystem approach to aquaculture 10 years on – a critical review and consideration of its future role in blue growth. *Reviews in Aquaculture*, *11*(3), 493–514. https://doi.org/10.1111/RAQ.12242

Chen, G., Chen, B., Yu, D., Tam, N. F. Y., Ye, Y., & Chen, S. (2016). Soil greenhouse gas emissions reduce the contribution of mangrove plants to the atmospheric cooling effect. *Environmental Research Letters*, *11*, 1–10. https://doi.org/doi:10.1088/1748-9326/11/12/124019

Chen, P. C., Chou, P. H., Lin, S. Z., & Chen, H. W. (2017). Capturing CO2 by using a microalgae culture recycle solution. *Chemical Engineering and Technology*, *40*(12), 2274–2282. https://doi.org/10.1002/ceat.201600409

Dahuri, R., Rais, J., Ginting, S. P., & Sitepu, M. J. (1996). *Pengelolaan sumber daya wilayah pesisir dan lautan secara terpadu*. Pradnya Paramita.

Dariah, A., Susanti, E., & Agus, F. (2011). *Simpanan karbon dan emisi CO_2 lahan gambut*.

Dewata, A. P. (2013). Analisis potensi gas rumah kaca (CH_4 dan CO_2) pada usaha tambak udang intensif dan persepsi masyarakat dalam pengelolaannya di Kabupaten Tulang Bawang, Provinsi Lampung [Master's thesis, IPB University]. http://repository.ipb.ac.id/handle/123456789/65711

District Fisheries Services. (2018). Statistik perikanan budidaya Kabupaten Karawang. Pemerintah Kabupaten Karawang.

Hambrey, J. (2017). The 2030 agenda and the sustainable development goals: the challenge for aquaculture development and management. *FAO Fisheries and Aquaculture Circular*, (C1141). http://www.fao.org/3/a-i7808e.pdf

Food and Agriculture Organization of the United Nations. (2020). *The state of world fisheries and aquaculture 2020: Sustainability in action*. https://doi.org/10.4060/ca9229en

Fawzi, N. I., & Husna, V. N. (2021). Aquaculture development monitoring on mangrove forest in Mahakam Delta, East Kalimantan. *IOP Conference Series: Earth and Environmental Science*, *750*(1). https://doi.org/10.1088/1755-1315/750/1/012002

Griggs, D. J., & Noguer, M. (2002). Climate change 2001: The scientific basis. Contribution of working group I to the third assessment report of the intergovernmental panel on climate change. *Weather*, *57*(8), 267–269. https://doi.org/https://doi.org/10.1256/004316502320517344

Hall, S. J., Delaporte, A., Phillips, M. J., Beveridge, M., & M, O. (2011). *Blue frontiers: Managing the environmental costs of aquaculture*. The WorldFish Center.

Heriyanto, N. M., & Subiandono, E. (2012). Komposisi dan struktur tegakan, biomasa, dan potensi kandungan karbon hutan mangrove di Taman Nasional Alas Psurwo. *Jurnal Penelitian Hutan Dan Konservasi Alam*, *9 (1)*, 23–32. https://doi.org/10.20886/jphka.2012.9.1.023-032

Hill, R., Bellgrove, A., Macreadie, P. I., Petrou, K., Beardall, J., Steven, A., & Ralph, P. J. (2015). Can macroalgae contribute to blue carbon? An Australian perspective. *Limnology and Oceanography*, *60*(5), 1689–1706. https://doi.org/10.1002/lno.10128

Hilmi, E., Parengrengi, Vikaliana, R., Kusmana, C., Iskandar, Sari, L. K., & Setijanto. (2017). The carbon conservation of mangrove ecosystem applied REDD program. *Regional Studies in Marine Science*, *16*, 152–161. https://doi.org/10.1016/j.rsma.2017.08.005

Kauffman, J. B., Arifanti, V. B., Hernández Trejo, H., del Carmen Jesús García, M., Norfolk, J., Cifuentes, M., Hadriyanto, D., & Murdiyarso, D. (2017). The jumbo carbon footprint of a shrimp: carbon losses from mangrove deforestation. *Frontiers in Ecology and the Environment*, *15*(4), 183–188. https://doi.org/10.1002/fee.1482

Kauffman, J. B., Heider, C., Norfolk, J., & Payton, F. (2014). Carbon stocks of intact mangroves and carbon emissions arising from their conversion in the Dominican Republic. *Ecological Applications*, *24*(3), 518–527. https://doi.org/10.1890/13-0640.1

Komarudin, R. (2013). *Model perubahan penggunaan lahan pesisir untuk mendukung rencana tata ruang wilayah Kabupaten Karawang* [Master's thesis, IPB University]. http://repository.ipb.ac.id/handle/123456789/63511

Laurion, I., Vincent, W. F., Macintyre, S., Retamal, L., Dupont, C., Francus, P., & Pienitz, R. (2010). Variability in greenhouse gas emissions from permafrost thaw ponds. *Limnology and Oceanography*, *55*(1), 115–133.

Liu, H., Ren, H., Hui, D., Wang, W., Liao, B., & Cao, Q. (2014). Carbon stocks and potential carbon storage in the mangrove forests of China. *Journal of Environmental Management*, *133*, 86–93. https://doi.org/10.1016/j.jenvman.2013.11.037

Merecí-Guamán, J., Casanoves, F., Delgado-Rodríguez, D., Ochoa, P., & Cifuentes-Jara, M. (2021). Impact of shrimp ponds on mangrove blue carbon stocks in Ecuador. *Forests*, *12*(7), 1–14. https://doi.org/10.3390/f12070816

Mitra, A., & Zaman, S. (2015). *Blue carbon reservoir of the blue planet*. Springer.

Moffitt, C. M., & Cajas-Cano, L. (2014). Blue growth: The 2014 FAO state of world fisheries and aquaculture. *Fisheries*, *39*(11), 552–553. https://doi.org/10.1080/03632415.2014.966265

Murdiyarso, D., Purbopuspito, J., Kauffman, J. B., Warren, M. W., Sasmito, S. D., Donato, D. C., Manuri, S., Krisnawati, H., Taberima, S., & Kurnianto, S. (2015). The potential of Indonesian mangrove forests for global climate change mitigation. *Nature Climate Change*, *5*(12), 1089–1092. https://doi.org/10.1038/nclimate2734

Páez-Osuna, F. (2001). The environmental impact of shrimp aquaculture: A global perspective. *Environmental Pollution*, *112*(2), 229–231. https://doi.org/10.1016/S0269-7491(00)00111-1

Pérez, A., Machado, W., Gutiérrez, D., Saldarriaga, M. S., & Sanders, C. J. (2020). Shrimp farming influence on carbon and nutrient accumulation within Peruvian mangroves sediments. *Estuarine, Coastal and Shelf Science*, *243*(July). https://doi.org/10.1016/j.ecss.2020.106879

Queiroz, H. M., Artur, A. G., Taniguchi, C. A. K., Silveira, M. R. S. da, Nascimento, J. C. do, Nóbrega, G. N., Otero, X. L., & Ferreira, T. O. (2019). Hidden contribution of shrimp farming effluents to greenhouse gas emissions from mangrove soils. *Estuarine, Coastal and Shelf Science*, *221*, 8–14. https://doi.org/10.1016/j.ecss.2019.03.011

Rachmawati, D., Setyobudiandi, I., & Hilmi, E. (2014). Potensi estimasi karbon tersimpan pada vegetasi mangrove di wilayah pesisir Muara Gembong Kabupaten Bekasi. *Omni-Akuatika*, *10*(2), 85–91.

Rahman, Effendi, H., & Rusmana, I. (2017). Estimasi stok dan serapan karbon pada mangrove di Sungai Tallo, Makassar. *Jurnal Ilmu Kehutanan*, *11*(1), 19–28. https://doi.org/10.1111/gcb.13051

Reeder, B. C. (2017). Primary productivity limitations in relatively low alkalinity, high phosphorus, oligotrophic Kentucky reservoirs. *Ecological Engineering*, *108*, 477–481. https://doi.org/10.1016/j.ecoleng.2017.06.009

Rifqi, M. (2020). *Dinamika blue carbon pada budidaya udang sebagai unsur penentu penataan areal pertambakan di wilayah pesisir* [Doctoral dissertation, IPB University].

Rifqi, M., Widigdo, B., Mashar, A., Nazar, F., Prihutomo, A., & Wardiatno, Y. (2022). Gaining aquaculture blue growth with low carbon emission shrimp farming technology. *Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan*, *12*(2), 363–371. https://doi.org/https://doi.org/10.29244/jpsl.12.2.363-371

Rifqi, M., Widigdo, B., Mashar, A., Nazar, F., & Wardiatno, Y. (2020). Strategy to gain the target of shrimp production in karawang district coastal area. *AACL Bioflux*, *13*(5), 2757–2769.

Rifqi, M., Widigdo, B., Mashar, A., & Wardiatno, Y. (2020). CO_2 and CH_4 flux from the water-air interface of three shrimp culture technologies. *AACL Bioflux*, *13*(2), 605–617.

Rifqi, M., Widigdo, B., Wardiatno, Y., Mashar, A., & Adianto, W. (2020). The daily variance of CO_2 and CH_4 emission from shrimp ponds. *IOP Conference Series: Earth and Environmental Science*, *420*(1), 1–9. https://doi.org/10.1088/1755-1315/420/1/012026

Segers, R. (1998). Methane production and methane consumption: A review of processes underlying wetland methane fluxes. *Biogeochemistry*, *41*(1), 23–51. https://doi.org/10.1023/A:1005929032764

Setyanto, P. (2008). Teknologi mengurangi emisi gas rumah kaca dari lahan sawah. *Iptek Tanaman Pangan*, *3*(2), 205–214.

Sidik, F., & Lovelock, C. E. (2013). Co2 efflux from shrimp ponds in Indonesia. *PLoS ONE*, *8*(6), 2–6. https://doi.org/10.1371/journal.pone.0066329

Siikamäki, J., Sanchirico, J. N., Jardine, S., McLaughlin, D., & Morris, D. (2013). Blue carbon: Coastal ecosystems, their carbon storage, and potential for reducing emissions. *Environment: Science and Policy for Sustainable Development*, *55*(6), 14–29. https://doi.org/10.1080/00139157.2013.843981

Siswanto. (2010). Systematic review sebagai metode penelitian untuk mensintesis hasil-hasil penelitian. *Buletin Penelitian Sistem Kesehatan*, *13*(4), 326–333.

Sondak, C. F. A. (2015). Estimasi potensi penyerapan karbon biru (blue carbon) oleh hutan mangrove Sulawesi Utara. *Journal of Asean Studies on Maritime Issues*, *1*(1), 24–29.

Sugiyono. (2008). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Alfabeta.

Tong, C., Bastviken, D., Tang, K. W., Yang, P., Yang, H., Zhang, Y., Guo, Q., & Lai, D. Y. (2021). Annual CO2 and CH4 fluxes in coastal erathen ponds with Litopenaeus vannamei in southeastern China. *Aquaculture*, *545*, 1–10. https://doi.org/10.1016/j.aquaculture.2021.737229

Ullman, R., Bilbao-Bastida, V., & Grimsditch, G. (2013). Including blue carbon in climate market mechanisms. *Ocean and Coastal Management*, *83*, 15–18.

https://doi.org/10.1016/j.ocecoaman.2012.02.009

Vallina, S. M., Cermeno, P., Dutkiewicz, S., Loreau, M., & Montoya, J. M. (2017). Phytoplankton functional diversity increases ecosystem productivity and stability. *Ecological Modelling*, *361*, 184–196. https://doi.org/10.1016/j.ecolmodel.2017.06.020

Vasanth, M., Muralidhar, M., Saraswathy, R., Nagavel, A., Dayal, J. S., Jayanthi, M., Lalitha, N., Kumararaja, P., & Vijayan, K. K. (2016). Methodological approach for the collection and simultaneous estimation of greenhouse gases emission from aquaculture ponds. *Environmental Monitoring and Assessment*, *188*(12). https://doi.org/10.1007/s10661-016-5646-z

Widigdo, B., Rifqi, M., Mashar, A., Nazar, F., & Wardiatno, Y. (2020). The contribution of phytoplankton in the carbon adsorption and stock during shrimp culture in brackishwater ponds. *Biodiversitas*, *21*(11), 5170–5177. https://doi.org/10.13057/biodiv/d211123

Xuan, B. B., Sandorf, E. D., & Ngoc, Q. T. K. (2021). Stakeholder perceptions towards sustainable shrimp aquaculture in Vietnam. *Journal of Environmental Management*, *290*, Article 112585. https://doi.org/10.1016/j.jenvman.2021.112585

Yang, P., Bastviken, D., Lai, D. Y. F., Jin, B. S., Mou, X. J., Tong, C., & Yao, Y. C. (2017). Effects of coastal marsh conversion to shrimp aquaculture ponds on CH_4 and N_2O emissions. *Estuarine, Coastal and Shelf Science*, *199*, 125–131. https://doi.org/10.1016/j.ecss.2017.09.023

Yang, P., Lai, D. Y. F., Huang, J. F., & Tong, C. (2017). Effect of drainage on CO_2, CH_4, and N_2O fluxes from aquaculture ponds during winter in a subtropical estuary of China. *Journal of Environmental Sciences (China)*, *65*, 72–82. https://doi.org/10.1016/j.jes.2017.03.024

Yang, Ping, Lai, D. Y. F., Yang, H., Tong, C., Lebel, L., Huang, J., & Xu, J. (2019). Methane dynamics of aquaculture shrimp ponds in two subtropical estuaries, Southeast China: Dissolved concentration, net sediment release, and water oxidation. *Journal of Geophysical Research: Biogeosciences*, *4*, 1430–1445. https://doi.org/10.1029/2018JG004794

Yogev, U., Atari, A., & Gross, A. (2018). Nitrous oxide emissions from near-zero water exchange brackish recirculating aquaculture systems. *Science of the Total Environment*, *628–629*, 603–610. https://doi.org/10.1016/j.scitotenv.2018.02.089

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 2 – AUGUST 2022

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Book Review

A New Paradigm of Literacy

A Book Review of *Literacy and Education*

Akhmad Idris

STKIP Bina Insan Mandiri, Surabaya, Indonesia
akhmadidris9@gmail.com

Introduction

The industrial revolution is a term to label industrial development from era to era. The first phase started in the early 18th century and has now entered the fourth phase, or 4.0. Davies (2015) stated that the 1.0 industrial revolution began with the use of steam engines and machines to replace human force. In the 2.0 industrial revolution, steam engines were replaced by electrical production machines as mass production engines. The 3.0 industrial phase was characterized by the emergence of computers in the 1970s. Finally, the rapid development of interconnected technology, sensor, and data analysis became the signs of the 4.0 industrial revolution emergence. The development has impacted conventional industries in the form of digitalization. Online transportation mode is one of the most prominent impacts of the fourth industrial revolution. This phase also creates massive shifts in many sectors, such as the use of video calls, fingerprints, and face scanners as security locks, social media to connect people from all around the world, and the digitalization of books, magazines, and journals.

The literacy sector also experiences many changes during the fourth phase of the industrial revolution, one of which is the use of a paperless mode of writing. The writing process currently involves less paper because it is digital-based. This trend is inseparable from the habit of the millennials (popularly known as the *micin* generation in Indonesia), who heavily rely on their smartphones to execute many tasks. The conventional publishers in Indonesia, Nova, Jawa Pos and Surya have also been demanded to digitalize their magazines, newspapers, books, and other conventional literacy media. With such ease of access to

ARTICLE INFO

Received: August 16, 2022
Received in revised form: August 24, 2022
Accepted: August 31, 2022
doi: 10.46456/jisdep.v3i2.327

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail:
journal.pusbindiklatren@bappenas.go.id

Supported by Indonesian Development Planners Association (PPPI)

any kind of reading on smartphones, reading and writing activities should be easier. Idris (2016), in a short story entitled *Buku Kusam untuk Damha,* wrote 'I want to make a literary work because if I die, it is merely my body not my name'. The quotation shows the priceless meaning of writing. Also, (Toer, 2011) emphasized that writing is a step to eternity. Everybody will experience death, but writing will remain a legacy despite the declining life force.

Obviously, the 4.0 industry contributes to the improvement of literacy habits because it allows all people to read everywhere. This new paradigm of literacy study is a novel idea that Kate Pahl and Jennifer Rowsell explored in their work, *Literacy and Education*. This book was first published in 2005. It was claimed that literacy is not a mere ability but also a social practice where contexts, identities, and practices are the keys (Pahl & Rowsell, 2005). The assumption originates from the fact that literacy activities can be performed everywhere because it is not place-limited activity. This new paradigm brought by Pahl and Rowsell is expected to bring new insight into the world of education and literacy.

Literacy activities can take place when a person is in a market, texting someone, playing games, and doing other social activities. Moreover, the assumption of literacy as a social practice can help students improve their literacy skills as it regards a text as a controlled medium by the writer and context.

The Literacy Concept in the 4.0 Industrial Era

Initially, the literacy process was understood as an activity related to books and writing (Pahl & Rowsell, 2005). It was then stigmatized as an activity learnt at schools. However, in the 4.0 industrial revolution, the literacy status has shifted from school-exclusive to more moderate. It means that the literacy process has turned into a more common activity, which is doable at any place and time.

The concept is becoming more general. The research of Idris (2016) on moral literacy showed that the literacy meaning had shifted from an exclusive to a more moderate context. It undergoes a generalization process from a school-specific activity to a popular social activity. In regard to this phenomenon, Djajasudarma (1999) explained that this meaning shift occurred due to the developing language in accordance with humans' understanding. In other words, the 4.0 industrial revolution, finally, has expanded its meaning.

Multimodal Texts as the Literacy Revolution in the 4.0 Industrial Era

In the fifth edition of KBBI (the Indonesian national standard dictionary), the word 'writing' is described as letter-making activities (numbers, characters, symbols, etc.) using a ballpoint (pencil, pen, board marker, etc.). The 4.0 industrial revolution has shifted the meaning of writing into a wider context. However, it does not change its essential meaning in the dictionary. Writing is no longer seen as an activity that exclusively utilizes a pencil, pen, ballpoint, and any other conventional writing equipment, but rather an activity that can also be done by using fingers on smartphones and other smartphone-like devices. Though Pahl and Rowsell (2005) stated that texts are artefacts, mostly, in this era, people have started to write without using pens and paper.

Texts are a human's life record that allows every phase of a human's life to be traced down. Thus, Pahl and Rowsell (2005) used the word 'multimodal' to explain a new way to produce a text.

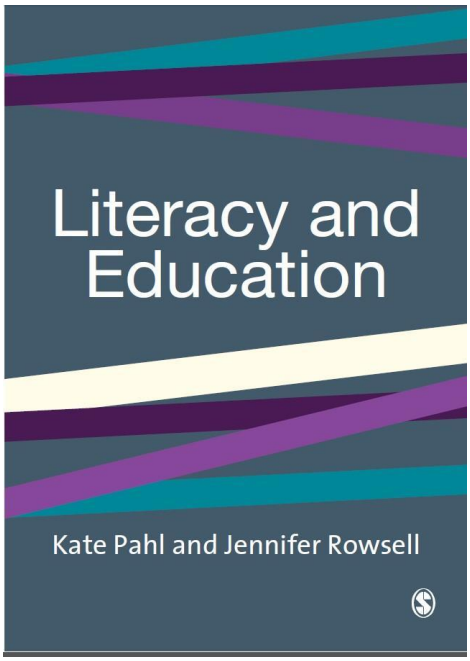
A multimodal text is a text produced using a variety of modes. It is related to the physical form of a text. The word 'multimodal' derives from the words 'multi' and 'mode'. Pahl & Rowsell (2005) stated that modes or various sorts of a multimodal text could be in the forms of visual, kinetic, three-dimension and gesture modes. The use of multimodal texts is a breakthrough in revolutionizing the literacy sector in the 4.0 industrial era.

In the 4.0 industrial era, the produced texts do not have to be in the forms of books or written papers but also in the forms of audio, visual presentations (graphs, tables, charts), pictures, and even social media

status. A wider and bigger interaction scale helps in the distribution of multimodal texts. Motivational quotes on Twitter or Instagram are one example of multimodal texts. The quotes are generally presented with audio and calming back sound. They comprise wise words but are only displayed in different forms. These are prime examples of multimodal texts. Another example is a caption that typically accompanies the photos posted on Facebook or WhatsApp status. A story caption from a certain event, a simple quote, paraphrased or plagiarized quote from famous figures or poetry-like prosodic words are also some examples of multimodal texts. Based on these, it can thus be claimed that everyone can now be a writer using different modes and styles based on their personal interests.

Overall, *Literacy and Education* provides a new understanding of literacy in education. If rated on a scale of 1 to 10, I would give this book a 9. This assessment was based on the topics and discussions relevant to the current time and on a language easy to understand.

In the end, the question is, are all the writers eager to be good writers or just common writers?



References

Davies, R. (2015). Industry 4.0: Digitalization for productivity and growth. *European Parliamentary Research Service*, 1–10. https://www.europarl.europa.eu/RegData/etudes/BRIE/2015/568337/EPRS_BRI(2015)568337_EN.pdf

Djajasudarma, T. F. (1999). *Semantik 2, pemahaman ilmu makna*. Refika Aditama.

Idris, A. (2016). Buku kusam untuk Damha. In *Lidah ungu bercabang dua yang membuat mereka menjadi cangkang abu* (p. 68). Pelangi Sastra.

Pahl, K., & Rowsell, J. (2005). *Literacy and education*. Paul Chapman Publishing.

Toer, P. A. (2011). *Anak semua bangsa* (13th ed.). Lentera Dipantara.

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

The Journal of Indonesia Sustainable Development Planning

SELF ASSESSMENT SINTA 2 ACCREDITATION ON PROCESS

CALL FOR PAPERS

VOL. 3 NO. 3 (DECEMBER 2022)

The Journal of Indonesia Sustainable Development Planning (JISDeP) is a journal published by Centre for Planners' Development, Education, and Training (Pusbindiklatren), Ministry of National Development Planning/National Development Planning Agency Republic of Indonesia (Bappenas) and supported by Indonesian Development Planners Association (PPPI).

This journal aimed at studying the issues of sustainable development from around the world to later be used as policy material in sustainable development planning in Indonesia, developing countries, and the world in general. This journal absorbs theoretical scientific studies as well as empirical experiences from researchers around the world, primarily from researchers who specialize in developing countries, to then publish them all widely to international forums as an applicable and innovative knowledge.

This journal gives important weight to the issue of sustainable development planning with regard to the mental and spiritual development of the people of Indonesia and the people of the world in terms of politics, economics, social, culture, environment, peace and justice, energy, and other strategic issues about sustainable development planning.

.:: RESEARCH PAPER .:: POLICY PAPER .:: COMMENTARY .:: BOOK REVIEW

Peer Review Process

JISDeP is an open access journal. All of the research article submitted in this journal will be provided in online version and can be free full downloaded. JISDeP also uses peer-review process by blind reviewer. The decision of accepted or not the article is determined by the agreement of both of editor's board and the reviewer.

Publication Frequency

JISDeP are published three times a year which are in April, August, and December of respective year.

Open Access Policy

This journal provides immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge. All articles published will be immediately and permanently free for everyone to read and download.

Guidance for Submission

1. The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in "Comments to the Editor").
2. The submission file is in OpenOffice, Microsoft Word, or RTF document file format.
3. Where available, URLs for the references have been provided.
4. The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.
5. The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines.
6. If submitting to a peer-reviewed section of the journal, the instructions in "Ensuring a Blind Review" have been followed.

Register and Login as Author to:
journal.pusbindiklatren.bappenas.go.id

Submit Paper Before:
OCTOBER 24TH, 2022

Indexed by: MORAREF, Google Scholar, Dimensions, Crossref, BASE, GARUDA, publons, Indonesia OneSearch, Scilit, ROAD, INDEX COPERNICUS INTERNATIONAL

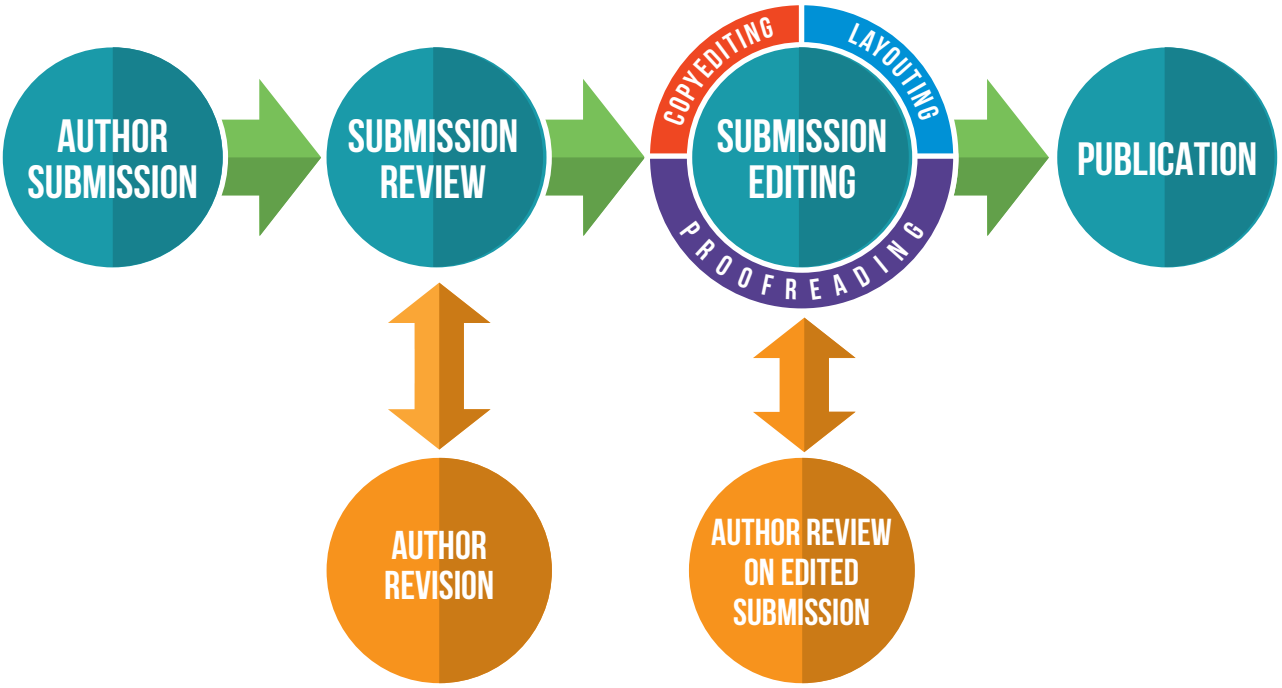
Published by: Kementerian PPN/Bappenas | Pusbindiklatren

Supported by: PPPI

Follow Us: JISDeP, @jisdep

JISDeP
The Journal of Indonesia Sustainable Development Planning

PUBLICATION PROCESS



AUTHOR GUIDELINES

- As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.
- The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in Comments to the Editor).
- The submission file is in OpenOffice, Microsoft Word, or RTF document file format.
- Where available, URLs for the references have been provided.
- The text is single-spaced; uses a 10-point Calibri font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.
- The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines.
- If submitting to a peer-reviewed section of the journal, the instructions in Ensuring a Blind Review have been followed.

JISDeP
The Journal of Indonesia Sustainable Development Planning

The Journal of Indonesia Sustainable Development Planning

Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/National Development Planning Agency (Bappenas),
Republic of Indonesia
Address : Jalan Proklamasi 70, Central Jakarta, Indonesia 10320
Phone : +62 21 31928280/31928285/31928279 | Fax: +62 21 31928281
E-mail : journal.pusbindiklatren@bappenas.go.id

Available online at journal.pusbindiklatren.bappenas.go.id

E-ISSN (online)
9 772722 084002

P-ISSN (print)
9 772721 830006

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING (JISDeP)
VOL. 3 NO. 2 - AUGUST 2022