EMAGRAP
Economic Military and Geographically Business Review
EMAGRAP 3(1): 23–39
ISSN 3025-3160

Institute for Advanced Science, Social and Sustainable Future
MORALITY BEFORE KNOWLEDGE

A comparative analysis of the implementation of public-private partnership (PPP) in the Palapa Ring project: Case study of western, central, and eastern packages

Putri Maziya Ikhsanti[1,*], Nicky Arnezti[1], Denisya Ziva Alika[1]
[1] *Department of Economics, Faculty of Economics and Business, Brawijaya University, Malang, Central Java, 65141, Indonesia.*
*Correspondence: maziyaputri26@gmail.com

Received Date: May 14, 2025 Revised Date: July 28, 2025 Accepted Date: July 29, 2025

ABSTRACT

Background: The Palapa Ring project, as one of the largest telecommunications infrastructure initiatives in Indonesia, uses a Public Private Partnership (PPP) scheme to support the construction of a national fiber optic network in 57 districts/cities in order to build internet accessibility, especially in the 3T area which is divided into western, central and east packages. However, there are differences in the implementation of the three packages. This research aims to analyze the comparison, the use of funds, and challenges. **Methods:** This research uses a qualitative descriptive approach with a literature study method and uses secondary data from various relevant sources. **Findings:** The impact of implementing this project shows that it has generally had a positive impact. The Eastern region has a more unequal average change in internet users while the west is more evenly distributed and more developed. Among the three packages, the Central region has a higher growth rate among the three packages. The Use of Funds shows that the Western Package has the highest efficiency with a utilization of 69% while the Central Package and Eastern Package are lower at 37.67% and 37.38% respectively due to significant geographical and operational challenges. The Availability Payment (AP) scheme supports the sustainability of the project. **Conclusion:** In conclusion, the Palapa Ring project positively impacts internet access, but regional differences in user growth and fund efficiency highlight the Western package as the most efficient compared to the more challenged Central and Eastern packages. **Novelty/Originality of this article:** This research recommends optimizing network utilization and operational cost efficiency to support the success of digital transformation in Indonesia.

KEYWORDS: availability payment; network utilization; palapa ring; PPP.

1. Introduction

The development of the ICT (Information and Communication Technology) sector has changed the way humans move (Tasueva et al., 2021). The role of ICT has become strategic in supporting social and economic development (Lestari et al., 2024). One of the most massive ICT sectors is the telecommunications sector. In 2020-2022, the percentage of households with cellular phones reached more than 90%. In addition, 65.16% of companies are engaged in ICT-related fields such as Internet Service Provider (ISP), Network Access Point (NAP), internet telephony, and other telecommunication services.

The massiveness of telecommunications is in line with the need for internet access, which is slowly transforming into one of the basic human needs (Fathimatuzzahra &

Cite This Article:
Ikhsanti, P. M., Arnezti, N., & Alika, D. Z. (2025). A comparative analysis of the implementation of public-private partnership (PPP) in the Palapa Ring project: Case study of western, central, and eastern packages. *Economic Military and Geographically Business Review, 3*(1), 23-39. https://doi.org/10.61511/emagrap.v3i1.2025.1873

Dompak, 2024). Internet usage in households reached 87.09% (Central Bureau of Statistics, 2023). Then, in 2024, the Indonesian Internet Service Providers Association/*Asosiasi Penyelenggara Jasa Internet Indonesia* (APJII) said that Indonesian internet users reached 221,563,479 people out of a total population of 278,696,200 people or around 79.5%. This penetration rate increased by 1.4% from the previous year. Not only this year, but in previous years, the penetration percentage continued to increase. In urban areas, the percentage of internet users in 2022 was around 74.16 percent and increased to 76.30 percent in 2023, while internet users in rural areas in 2022 were around 55.92 percent and increased to 59.33 percent in 2023. During the period 2019-2023, Internet Service Provider (ISP) companies and ISP subscribers also continued to increase. By 2023, the number of ISP subscribers will reach 13.54 million.

The rapid development of the telecommunications sector and the growth of internet users have an important effect on the economy in Indonesia. As Sollow Theory and Romer Theory say, it is not only labor and capital that affect the economy, but technology also has a role in the socio-economic progress of a country (Khaira & Ariusni, 2020). Increased use of data services and digital connectivity will accelerate technology adoption in various sectors, including e-commerce and fintech (Lestari et al., 2024). Based on the results of research with a sample of 7 ASEAN countries, including Indonesia, the empirical results state that internet users and trade have a significant and positive influence on economic growth (Wahab et al., 2020).

As the 15th largest country in the world with the 4th largest population, which also consists of thousands of islands and remote areas, equitable internet access is a challenge. This is due to several factors, such as geographical difficulties and the sheer size of the region. However, the most important factor is the limited telecommunications infrastructure. In fact, infrastructure development in the ICT sector plays an important role in the digital era economy. Regions with more advanced ICT development show a higher increase in economic growth, especially through the creation of new jobs in various technology sectors and digitalization in small and medium enterprises (SMEs) (Brodny & Tutak, 2022; Chege & Wang, 2020; Prayoga et al., 2024).

In light of this, the government is committed to equalizing internet access by developing telecommunications infrastructure through a large project called Palapa Ring. This project aims to provide equal internet access throughout Indonesia consisting of 7 rings, namely Sumatra, Java, Kalimantan, Nusa Tenggara, Papua, Sulawesi and Maluku. The Palapa Ring project, which relies on fiber optic, is also an answer to the challenge of the limitations of the copper cable access network which is considered unable to accommodate large bandwidth capacity and high speed in communication technology in Indonesia. This is because fiber optic technology is known for its speed in transmitting data.

However, the large scale of this project would require a lot of money. If fully borne by the government, there is a risk of overrunning the state budget. So, a PPP (Public-Private Partnership) scheme financing mechanism is the right option (Maulana, 2021). In its implementation, the Palapa Ring project is also divided into three projects, namely Palapa Ring West, Palapa Ring Central, and Palapa Ring East. Apart from the geographical and population differences, the division of the project scale is also an effort to minimize costs and risks.

The implementation of PPP in the Palapa Ring Project shows significant dynamics and differences in each package. Therefore, a comparative analysis of the three packages is important to understand the extent to which the effectiveness of PPP implementation in national telecommunications infrastructure projects can provide lessons for similar projects in the future. This research aims to analyze and compare the implementation of PPP in the West, Central, and East Packages of the Palapa Ring Project by reviewing the different aspects of the Palapa Ring PPP project between the western, central, and eastern packages from geographical aspects, safety factors, target time, use of funds, to its impact. In addition, this study aims to determine the extent to which the Availability Payment (AP) scheme is effective in ensuring project sustainability and how the effectiveness of capex and opex management on project efficiency and performance. With a case study approach and

descriptive-comparative analysis, this research is expected to contribute to the development of a more adaptive and effective PPP model in the context of national strategic infrastructure development.

The three studies above show that the success of the Palapa Ring project is not only determined by technical aspects, but also by the effectiveness of PPP and its sustainable impact on economic activity. The study by Nugraha et al. (2020) highlights the importance of business process efficiency and coordination between project partners, while Fachrurrozi (2019) provides an overview of investment feasibility based on a capital budgeting approach. On the other hand, Eschachasthi et al. (2021) emphasized the contribution of digital infrastructure to improving connectivity and local economic activity. The three studies discuss aspects of the process, financial feasibility, and economic impact separately. There are not many studies that specifically and comparatively analyze the effectiveness of financing and implementation between the West, Central, and East packages. Therefore, this study was written to fill this gap by providing a comparative analysis of the effectiveness of the implementation of the PPP scheme in the Palapa Ring project in the three regional packages.

2. Methods

This research utilizes a descriptive qualitative approach with a literature study method to analyze the application of Government and Business Entity Cooperation (PPP) in the Palapa Ring project which is divided into three regional packages, namely the West Package, Central Package, and East Package. According to M. Nazir in his book research methods, literature study is a data collection technique by conducting a study of books, literature, notes, and reports that have something to do with the problem being solved. This approach was chosen to allow researchers to explore information without making direct field observations. The purpose of this study is to understand the differences in effectiveness, efficiency, and socio-economic impacts of implementing PPP schemes in each region.

The type of data used in this study is secondary data. As defined by Sugiyono (2016), secondary data is a data source that is not directly received by data collectors, either through other people or through documents. In this study, the secondary data were obtained from various relevant and trusted sources, including documents and publications on the official PPP government website of the Ministry of Finance, the Palapa Ring website and peer-reviewed scientific journal articles. Source selection was based on relevance to the topic and level of credibility. To enhance data validity, cross-checking was carried out by comparing multiple sources that addressed the same topics. The data were analyzed using thematic analysis techniques, which involved identifying, classifying, and grouping the main themes related to the effectiveness of PPP implementation, financing efficiency, implementation constraints, and socio-economic impacts of each project package. These themes were then compared qualitatively across the three regional packages to capture differences in outcomes, challenges, and lessons learned from the PPP application in each zone.

3. Results and Discussion

3.1 Public-private partnership (PPP)

Public-Private Partnership (PPP) is a collaboration between the Government and Business Entities in the provision of infrastructure aimed at the public interest by referring to specifications previously set by the Minister/Head of Institution/Head of Region/State-Owned Enterprise/Regional-Owned Enterprise, which partly and/or entirely uses the resources of the Business Entity with due regard to risk sharing between various parties (Presidential Regulation No. 38 of 2015). The Public-Private Partnership (PPP) scheme is increasingly being considered as a strategic solution amid the limited availability of

development budgets (Kartikasari & Retnaningsih, 2024). According to the Ministry of Finance (2024), Focus on procurement of infrastructure service provision; Business/private entities finance the provision of infrastructure first, so as to overcome the limitations of the state/local budget; there is room for business entities to innovate both during infrastructure development and innovation to drive efficiency in service delivery; there is risk sharing between the government and the enterprise; single contract with the enterprise for all infrastructure delivery activities; government support is available at the project preparation stage; sufficient funding needs in a sustainable manner in infrastructure provision through the mobilization of private funds; realizing quality, effective, efficient, right target, and timely infrastructure provision; creating an investment climate that encourages the participation of business entities in infrastructure provision based on sound business principles; encouraging the use of the principle of users paying for services received, or in certain cases considering the ability of users to pay; and/or providing certainty of return of the business entity's investment in the provision of infrastructure through payment by periodic mechanism of the government to the business entity.

This is explained in the principles of PPP which include: partnership, namely cooperation between the government and carried out by the agency based on laws and regulations business provisions and requirements that consider the needs of both parties; benefit, namely infrastructure provision is carried out by the government with business entities to provide social and economic benefits for the community; competing, namely the procurement of business entity cooperation partners is carried out through fair, open and transparent selection stages, and pays attention to the principles of fair business competition; and risk control and management, namely cooperation in infrastructure provision is carried out with risk assessment, development of management strategies, and mitigation of risks.

To support the implementation of PPP in Indonesia, the Ministry of Finance has committed to providing various government facilities and support, through; 1) Project Development Facility (PDF), is a facility provided to assist PJPK in preparing the final pre-feasibility study, tender documents, and assisting Person in Charge of Cooperation Project/*Penanggung Jawab Proyek Kerja Sama* (PJPK) in conducting PPP project transactions until obtaining financing from financing institutions, 2) viability support or Viability Gap Fund (VGF), is government support in the form of contributions through a portion of construction costs provided in cash to PPP projects that already have economic feasibility but do not yet have financial feasibility. Viability support is provided after there are no other alternatives to make the PPP project financially viable. Local governments can also contribute to this support after obtaining approval from the Infrastructure Guarantee Council, 3) infrastructure guarantee, is the provision of guarantees for PJPK's financial obligations aimed at paying compensation to business entities in the event of infrastructure risks in accordance with the allocation agreed in the PPP agreement and is the responsibility of PJPK. Infrastructure guarantee is implemented by PT PII which acts as a single window policy. If the scope of guarantee needs exceeds the capital capacity of IIGF, a joint guarantee will be carried out between the Ministry of Finance and Indonesia Infrastructure Guarantee Fund (IIGF).

Performance indicators of a public sector provide information about the budget money spent produces a certain value for the community. The indicator used is Value for Money (VfM) which consists of economy, efficiency, and effectiveness (Haryadi et al., 2022). First, economics, related to analyzing the extent to which public sector organizations can minimize the input resources used by avoiding wasteful and unproductive spending. Second, efficient, is a comparison of outputs and inputs in relation to predetermined performance standards or targets. Achieving maximum output with low input indicates efficiency. Third, effectiveness: the level of achievement of program results with set targets.

There are 3 main factors that can drive improvements in value for money; 1) risk allocation. The allocation of risk in PPP procurement schemes is the main factor that makes PPPs have a higher VfM than conventional procurement. The VfM value will increase if the risk costs are allocated appropriately between the government and the private sector, 2)

output specification. The private sector is believed to have better ability and knowledge to innovate in order to achieve the output specification, so that the output specification can be achieved with more efficient cost, 3) performance-based contracting. Performance in PPPs focuses on the quality of service during operation rather than on construction completion targets as in conventional procurement. With a performance-based mechanism in place, the Private Sector is incentivized to maintain the quality of their performance throughout the concession period and thereby improve VfM.

In addition, in implementing PPP, there are several schemes, namely (Ministry of Finance, 2024): Operation & Maintenance (O&M) is a private operator/business entity that, under contract, operates a government-owned asset for a specified period of time. Ownership of the asset remains with the government. Build-Finance (BF) is the private/business entity constructing the asset and finances the capital costs only during the construction period. Design-Build-Finance-Maintenance (DBFM) is the enterprise that designs, builds, finances the asset and provides maintenance services (hard facilities management) under an agreed long-term agreement. Design-Build-Finance-Maintain-Operate (DBFMO) is the business entity that designs, builds, finances, and provides maintenance and operation services under a long-term agreement. Asset operation is also included in projects such as the operation of bridges, roads and water treatment plants.

3.2 PPP in telecommunication

In the telecommunications sector, PPP is an important instrument to accelerate equitable access to information, especially in the 3T (Disadvantaged, Frontier, and Outermost) areas. Large investments and high financial risks make private involvement strategic. PPP projects in this field often involve the development of backbone infrastructure, fiber optic networks, BTS, and the provision of high-tech internet services (Susanti, 2024).

According to the World Bank (2018), PPPs in the telecommunications sector can improve operational efficiency and expand network coverage, provided there is legal certainty, attractive incentive schemes, and proportional risk sharing. In the Public-Private Partnerships in Telecommunications Infrastructure Projects report, PPPs are recognized as an effective strategy for narrowing the digital divide. These partnerships enable the provision of alternative financing sources beyond the constraints of the state budget, thereby addressing funding limitations. Additionally, the involvement of the private sector helps accelerate the development of telecommunications infrastructure, leveraging both financial and technical capabilities. Operational efficiency is also enhanced through the transfer of advanced technology and the application of private sector expertise. Most importantly, PPPs facilitate the expansion of telecommunications service coverage, including in rural and remote areas that are often underserved in traditional development models. The World Bank also emphasizes that the success of PPP in telecommunications depends on the clarity of the legal framework, rational investment incentives, and a proportional risk-sharing mechanism between the government and private partners.

3.3 Palapa ring project

Palapa Ring was one of the ideas offered at the 2005 Indonesia Infrastructure Summit (IIS) held in Jakarta (January 17-18, 2005). The Palapa Ring project is the construction of a national fiber optic backbone network infrastructure that aims to equalize broadband access along 36,000 km (Directorate General of Informatics Applications). In addition, according to the Indonesia Infrastructure Guarantee (Persero) 2025, the Palapa Ring Project is one of the backbone network development projects designed using the Marine Cable Communication System and Optical Fiber Communication System to 57 unserved cities/districts. This project is a National Strategic Infrastructure project as stated in Presidential Regulation (Perpres) No. 3 of 2013, which is also categorized as a National Priority Project. The presence of Palapa Ring makes the 3T (Disadvantaged, Frontier and

Outermost) areas that were previously not connected to the internet become connected. Palapa Ring aims to build a fiber optic network in 57 districts/cities in remote areas with difficult geographical contours and relatively small potential users so as to create a national telecommunications system backbone that connects districts/cities (KPPIP, 2018). The project is targeted to be able to distribute broadband networks with speeds of 10Mbps in rural areas and 20 MBps in urban areas.

The Palapa Ring provides benefits in supporting fixed and mobile telecommunications networks, including tele-education and tele-health at low cost and TV broadcasts to villages. In addition, Palapa Ring will facilitate the implementation of Universal Service Obligation (USO), increase in the utilization of e-government, e-education, e-healthy, and internet access by anyone (Labirin, 2023).

The government's plan for the Palapa Ring Project is a broadband fiber optic network in the form of a ring around seven islands, namely Sumatra, Java, Kalimantan, Nusa Tenggara, Sulawesi, Maluku, and Papua as well as eight connecting networks and one large ring around Indonesia either via the seabed or via land. According to the Director General of Post and Telecommunications, Basuki Yusuf Iskandar, in December 2007, "Communication Technology Development", the benefits of Palapa Ring for Indonesia's development are: availability of communication services from voice to broadband to all cities/regencies in Indonesia; there will be investment efficiency that will encourage more affordable telecommunications tariffs; there will be accelerated development in the communications sector, especially in eastern Indonesia, and will encourage the growth of variants of telecommunications service providers and services and the existence of applications such as distance learning, telemedicine, e-government, and other applications, can be implemented up to the city/district.

According to the Public-Private Partnership (PPP) Ministry of Finance of the Republic of Indonesia, the division of the palapa ring is as follows: First, West Package. The Palapa Ring West Package project connects the provinces of Riau, Riau Islands (up to Natuna Island), Jambi and West Kalimantan. The Palapa Ring West Package project is prepared by a consultant from PJPK. Second, Central Package. The Palapa Ring Central Package project connects North Sulawesi, Central Sulawesi, North Sulawesi, Central Sulawesi, Southeast Sulawesi, North Maluku and East Kalimantan. The Palapa Ring Central Package project was prepared by a consultant from PJPK. Third, East Package. The Palapa Ring East Package project connects East Nusa Tenggara, Maluku, Papua and West Papua. The Palapa Ring West Package project was prepared by PT SMI through the Ministry of Finance facility.

3.4 Availability payment (AP)

The Palapa Ring project is a pioneering project in the telecommunications sector that uses the Availability Payment (AP) facility offered by the government under the Public Private Partnership (PPP) scheme. This scheme is an innovative alternative for infrastructure funding that does not directly generate revenue from service users. Based on Presidential Regulation No. 38 Year 2015, availability payment is a periodic payment by the Minister/Head of Institution/Regional Head to the Implementing Business Entity for the availability of infrastructure services in accordance with the quality and/or criteria as specified in the PPP agreement. The legal basis for the implementation of availability payment in Indonesia is stated in PMK No. 260/PMK.08/2016 concerning Procedures for Payment of Service Availability in PPP Projects and in the Minister of Home Affairs Regulation No. 96/2016 concerning Payment of Service Availability in the Framework of Regional Government Cooperation with Business Entities in the Provision of Infrastructure in the Region. The purpose of availability payment is to ensure the availability of quality services to the community on an ongoing basis and optimize the use value of the budget.

Availability payment is a solution that balances the government's financial capability and project feasibility (Kominfo, 2024). The principles that need to be considered in using the availability payment scheme are the state's financial capacity, fiscal sustainability, and fiscal risk management. This scheme is usually used in the absence of revenue from service

users, for example for the development of public service infrastructure. Infrastructure that is provided free of charge to the public costs a lot to build but does not get compensation when used. For this reason, the availability payment scheme is a suitable scheme. In addition, this scheme is also used when the potential revenue is not significant to cover the investment of the business entity. Availability Payment uses the assumption that the private sector will be charged with the development and operational costs and the government will be charged with the demand risk. The mechanism of availability payment involves two determinants of payment: output of the facilities/services and performance of the service. The government will pay the availability payment during the concession period. In this case, the government will pay for the Palapa Ring project for 15 years from the operating period.

The advantages of the availability payment scheme for the government are that it increases the appeal of PPP projects to investors and allows the government to obtain infrastructure services without having to provide large funds at the beginning of the project for construction. Business entities also feel the advantages of the availability payment scheme, namely not bearing demand risk, guaranteed financial viability, and certainty of return. With all these advantages, availability payment is an important instrument in ensuring the sustainability and feasibility of strategic infrastructure projects such as Palapa Ring, especially in supporting public services in hard-to-reach areas.

3.5 Digital infrastructure to regional development

The digital economy can be defined as part of the economic output derived from digital technology with a business model based on digital goods or services (Aulia & Mubarrok, 2023). The concept of digital economy was first introduced by Don Tapscott (The Digital Economy, 1995), which means a sociopolitical state and economic system characterized as an intelligent space, including information, various access instruments, capacity, and information ordering. The digital economy has become an integral part of the global economy, driven by the evolution of information and communication technology (ICT). Digital technologies have changed the way information is stored, calculated, and transmitted, and reduced the economic costs associated with digital activities (Mirabito & Morgenstern, 2004). In supporting the smooth running of the digital economy, the existence of adequate digital infrastructure is indispensable. According to the OECD (2020), digital infrastructure forms the backbone of digital economies, providing the channels through which information, services, and markets operate globally.

Digital infrastructure is the technological foundation in the form of physical and virtual networks that facilitate the connection and function of digital devices in a society or organization. Digital infrastructure enables data transmission, communication, and access to various digital services. Digital infrastructure plays an important role in regional development that can fulfill various aspects of life, such as economic, social, and environmental. Digital infrastructure contributes significantly to regional socio-economic development in improving people's quality of life and accelerating economic transformation. The provision of digital infrastructure supports accessibility as it enables local people to access information, education, health services, and business opportunities. The use of digital technology has also supported efficiency as it helps reduce transaction costs and operational costs thereby improving the efficiency of work processes. Telecommunications infrastructure not only improves direct productivity, but also provides spillover effects in the form of social progress, improved community skills, and encourages innovation at the local level.

In 2015, Indonesia's information and communication technology development was categorized as moderate. Based on Databoks (2016), Indonesia's Information and Communication Technology Development Index (IP-ICT) in 2015 was at the level of 4.83 (scale 0-10). IP-ICT is an indicator of information and communication technology development of a region with indicators of international internet bandwidth, literacy rate, and number of cellular phone users. Papua was recorded as the province with the lowest IP-ICT in 2015 with a level of 2.91. Eastern Indonesia dominated the lowest 2015 IP-ICT and

was below the national average. A total of 22 provinces have IP-ICT in the low category, 11 provinces in the medium category, and only 1 province in the high category, namely DKI Jakarta with an index level of 9.25. To equalize telecommunications infrastructure throughout the nation, thus the Palapa Ring project was proposed.

Palapa Ring is a national telecommunications infrastructure project that aims to bridge the digital gap between regions in Indonesia. Palapa Ring supports digital inclusion by providing equitable internet access across Indonesia, including the 3T areas. This creates more equal economic opportunities and reduces socio-economic disparities. Studies show that every 10% increase in broadband penetration can increase economic growth by 1.38% (International Telecommunication Union, 2020). Digital infrastructure contributes to regional GRDP growth by expanding internet-based economic activities. This project serves as a catalyst for the sustainable achievement of the Sustainable Development Goals (SDGs), such as point 8 (Decent Work and Economic Growth) and point 9 (Industry, Innovation and Infrastructure).

Table 1. Previous research

Author(s)	Methods	Findings
Nugraha et al. (2020)	Case Study of Telecommunication and Information Accessibility Agency	This study evaluates the implementation of the Palapa Ring Project business process using the BPI method. The results showed that the pattern of government and business entity cooperation (PPP) played an important role in project management, especially in meeting the target of telecommunications infrastructure development in 3T (frontier, remote, and underdeveloped) areas. However, the study also identified several barriers, such as schedule delays and lack of coordination between PPP partners.
Fachrurrozi (2019)		This study highlights the role of the PPP scheme in supporting the success of the West Palapa Ring Project, including a government subsidy of IDR 1.49 trillion that ensures project sustainability. The results of the analysis show that the West Package successfully meets the network capacity needs in strategic areas such as Riau, Riau Islands, and West Kalimantan, with investment results that are considered feasible based on NPV, IRR, and Payback Period parameters.
Eschachasthi et al. (2021)		This study reveals that the increased connectivity generated by the Palapa Ring Project contributes to the growth of economic activity. With better internet access, businesses can operate more efficiently, reach new markets, and increase productivity, thus supporting the digital economic transformation in Indonesia.

3.6 The impact analysis of the palapa ring project

In general, the Palapa Ring Project plays a role in accelerating economic growth from the Information and Telecommunication Services Sector. The Palapa Ring project is predicted to contribute 0.04% in increasing Indonesia's economic growth (Amalia et al., 2021). The use of optical fiber in this project is expected to contribute to the faster and more stable internet access allowing companies to increase productivity and business innovation so that they are more efficient and able to compete in the global market (Dwiputra et al, 2025). However, in the context of comparing the impact between the three regional packages, we can analyze it from two aspects (Eschachasti et al., 2022).

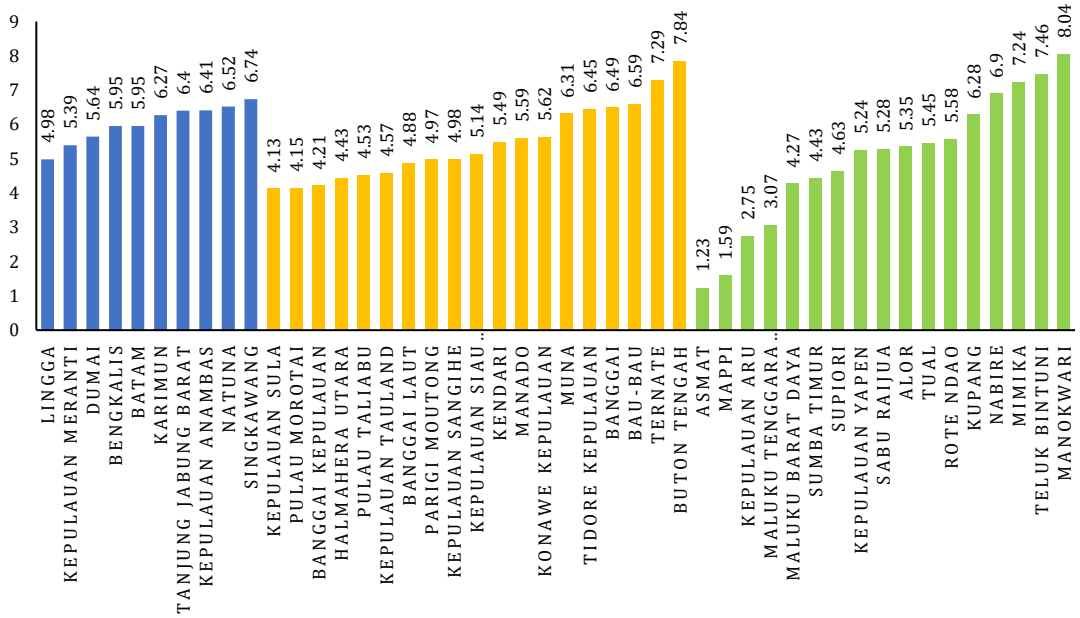

Fig. 1. Average change of internet users in each region

The Figure 1 above is the average change in the number of internet users per regional package (2015-2020). In general, there is a positive change from each city in each regional package. Based on the height of the graph, it can be concluded that the regions in the East Package have a relatively more unequal average change in internet users compared to other packages. This condition is clearly seen from the gap in change between Manokwari as the city with the highest increase, which reached 8, and Asmat Regency as the lowest in the same package area, which only reached 1. This suggests a concentration of benefits in urban centers with limited spillover to more remote districts. Meanwhile, the regions in the West Package experienced a more evenly distributed average change compared to the other two packages. This condition can be seen from the lowest level of change in the West Package which is still higher than the lowest average city in the other packages, but does not have a high gap with the highest change in the West Package itself. This is because the western Palapa Ring project was commissioned earlier than the other packages and the number of cities or districts in the western region is the smallest of the two packages.

The Figure 2 above shows the percentage of internet users in each region. In the West Package, the highest users are in Batam City at 74.07%, in the Central Package in Kendari City at 70.27% and in the East Package in Kupang City at 71.01%. Based on the number of users, the East Package remains the region with relatively higher inequality compared to the other packages. This is because the lowest percentage of users in the East Package is only 6.7%, which means it has a gap of more than 50%. This suggests that while infrastructure exists, affordability, digital literacy, and relevance of services may hinder adoption in marginalized regions.

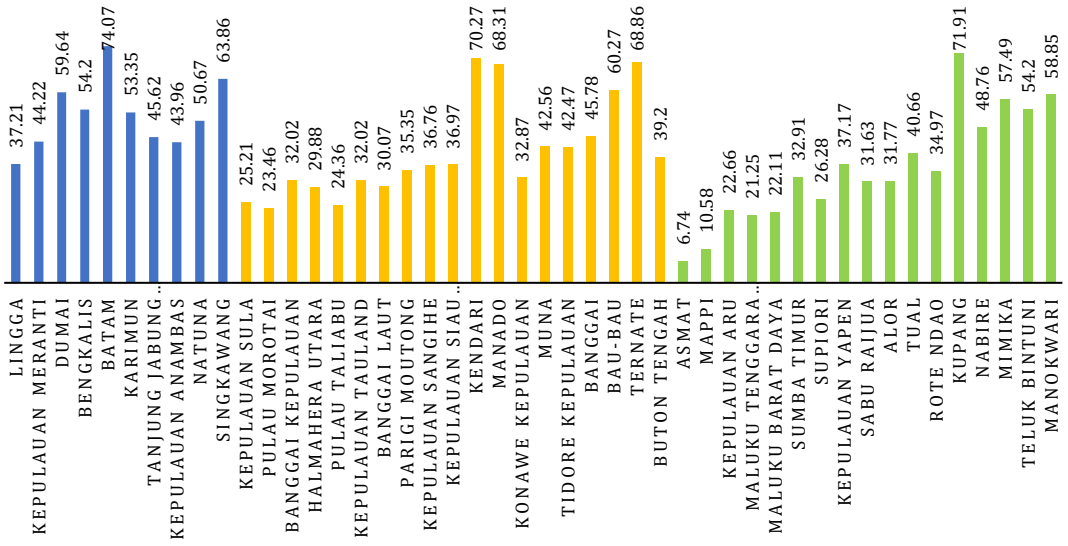

Fig. 2. Percentage of internet users in each region

The Figure 3 represents the average economic growth after the Palapa Ring in each regional package. Most regions in the 3 packages experienced positive average economic growth. However, in the West Package there are two districts that experience negative average economic growth, namely Anambas Islands and Bengkalis. In this aspect, the Central package has a relatively higher economic growth rate than the western and eastern packages. This condition can be seen from the city with the highest percentage of economic growth in the Central Package (Banggai) is the highest among other packages and the city with the lowest economic growth rate in the Central Package (Kepulauan Sula) is still higher than the lowest percentage city in other packages. This outcome suggests that infrastructure investment in the Central Package might be better complemented by enabling factors, such as local policy support, entrepreneurial capacity, or strategic positioning in the regional economy. On the other hand, although the West Package is technologically more mature and efficient in utilization, it still consists of two districts that experienced negative economic growth post-project. This anomaly points to the limitations of infrastructure alone in stimulating growth, especially if not aligned with broader economic planning and local needs.

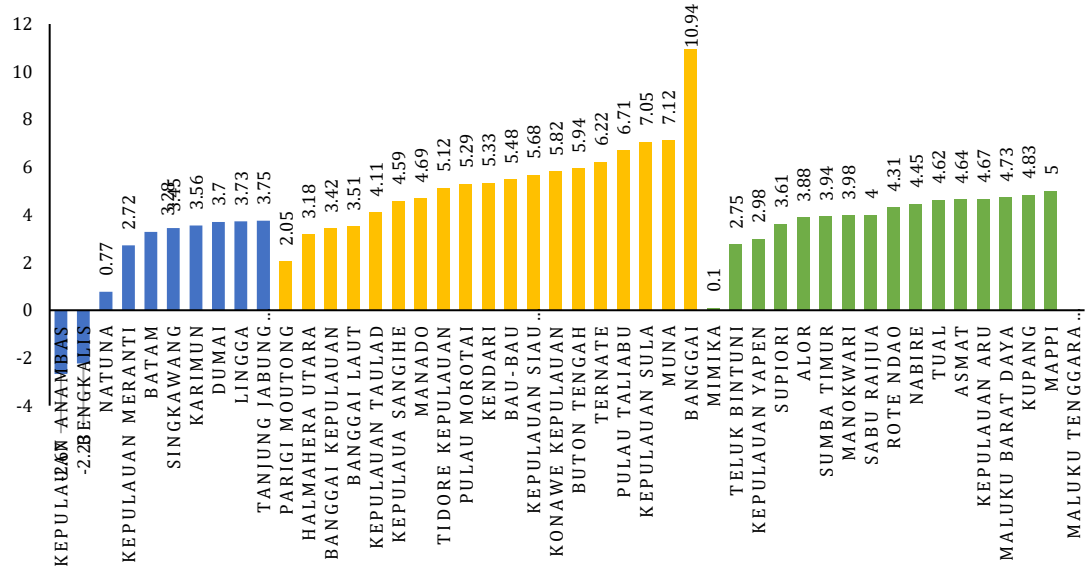

Fig. 3. Average economic growth after the palapa ring in each region

The Figure 4 is GRDP data from each region in the 3 Palapa Ring packages. Based on this data, Batam City in the West Package scores the highest GRDP, reaffirming its position as a key industrial and digital hub. Conversely, Morotai Island in the Central Package reflects the lower end of the economic spectrum. In terms of GRDP, overall the 3 packages are still relatively low. Even so, some areas in the West Package are quite dominating such as Batam City and Bengkalis. These findings provide critical policy lessons. The relatively stronger performance of the Central Package suggests that infrastructure success is not determined by physical access alone, but also by institutional readiness, local governance, and follow-up investments. Areas with better integration between infrastructure provision and local development programs tend to yield more tangible economic benefits.

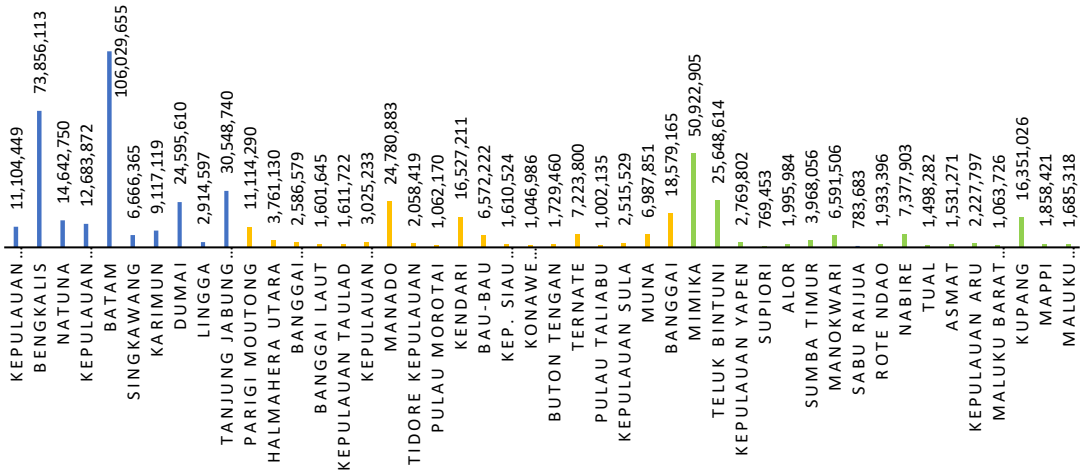

Fig. 4. Gross Domestic Regional Product (GDRP) from each region

3.7 Utilization of funds in the palapa ring project

The Palapa Ring project is one of Indonesia's mega telecommunications infrastructure projects that uses a public-private partnership (PPP) scheme. The Availability Payment (AP) based funding scheme ensures that the business entity gets payment from the government after the project operates according to the service target. This financing not only involves the initial budget used for infrastructure development, but also includes payments made in stages after the project is fully operational. The Palapa Ring project packages are funded through a combination of the state budget and contributions from the business entities involved in the PPP scheme. This scheme ensures that the government plays a role in providing financial support, while the business entities are responsible for most of the initial and operational costs.

The west package received an allocation of approximately IDR 1.28 trillion for infrastructure development in 5 districts. The budget for the West Package is smaller than the other packages because this region has better infrastructure and more accessible terrain. The telecommunication network was successfully built along 2,124 km. As of 2023, network utilization in the western region reached 69%, indicating that the funds allocated for physical network development were used efficiently. The availability payment (AP) value that will be given to the business entity is IDR 3.486 trillion.

The central package received an allocation of approximately IDR 1.38 trillion for infrastructure development in 17 districts/cities. As the terrain was more varied, this package required a slightly larger budget than the West Package. The telecommunication network was successfully built along 3,102 km. As of 2023, network utilization in the Central Package was recorded at only 37.67%, reflecting the challenges in network utilization in the area. The availability payment (AP) value to be given to the business entity is IDR 3.508 trillion.

The east package received the largest funding allocation, reaching IDR 5.13 trillion for 35 districts. This is due to greater geographical challenges, especially in the hard-to-reach

Papua region. The telecommunication network was successfully built along 7,003 km. As of 2023, network utilization in the East Package was the lowest, reaching only 37.38%. This low figure indicates the low level of utilization of the infrastructure that has been built. In the case of the Eastern Package, investment challenges are faced due to low network utilization due to limited purchasing power. The availability payment (AP) value that will be given to the business entity is IDR 14.068 trillion.

The efficient use of funds in the Palapa Ring project can be assessed based on how the allocated funds are used to achieve the desired results. In this case, the efficiency of funds is seen through the difference between capital expenditure (capex) and operational expenditure (opex). Capex refers to costs incurred for investment in long-term physical assets, such as infrastructure development. Opex refers to the costs incurred for the operation and maintenance of the network after construction is complete. The West Package has a capex value that exceeds opex (IDR 1.22 trillion>IDR 1.2 trillion). A larger capex indicates that more funds are used for physical development and technology procurement than are used to maintain operations. A larger capex will be more efficient in the long run because a large investment at the beginning can generate greater benefits in terms of operations.

Unlike the West Package, the Central Package has a capex value that does not exceed the opex value (IDR 1.09 trillion < IDR 1.3 trillion). The East Package also has the same condition where the opex value exceeds the capex (IDR5.08 trillion < IDR5.13 trillion). A higher opex indicates that the project requires more money to sustainably operate, maintain, and repair the infrastructure. One of the reasons for the high opex is that the terrain is difficult and requires high maintenance costs. The network in the East Package is also the longest line touching 7,000 km. In addition, the security risk in the East Package is also a cause of high maintenance costs. If Opex continues to increase over time, this could indicate challenges in project management or a lack of planning for effective maintenance.

Table 2. Comparison matrix of palapa ring project

Aspect	West Package	Central Package	East Package
Capital Expenditure (Capex)	IDR 1.28 trillion	IDR 1.38 trillion	IDR 5.13 trillion
Operational Expenditure (Opex)	IDR 1.2 trillion	IDR 1.3 trillion	IDR 5.08 trillion
Availability Payment (AP)	IDR 3,486 trillion	IDR 3,508 trillion	IDR 14.068 trillion
Network Utilization (2023)	69%	37.67%	37.38%
Network Length	2,124 km	3,102 km	7,003 km
Funding Efficiency	High: high utilization and larger capex upfront	Moderate: lower utilization and high opex	Low: high opex and utilization
Operational Challenges	Relatively accessible terrain, existing infrastructure	Mixed terrain	Difficult terrain, high security risks
AP to Utilization Ratio	More efficient (smaller AP, higher utilization)	Less efficient (larger AP, lower utilization)	Least efficient (highest AP, lowest utilization)

The availability payment that will be given by the government to the business entity implementing the project in each package has a high figure, which exceeds the total costs incurred (capex and opex). The availability payment that will be given to business entities in the West Package for 15 years of operation amounts to IDR 3.486 trillion. Business entities in the Central Package and East Package will also receive payments over the 15-year operating period with values of IDR 3.508 trillion and IDR 14.068 trillion, respectively. The value that is far above the project cost is due to various considerations. The excess value is the profit margin. Business entities not only incur costs, but also take risks and expect a

return on investment from long-term projects. Availability payments reflect compensation for complexity and risk, not just the amount of investment. The West Package received the least value because it has much lower complexity than the other two packages.

Efficiency can also be seen from the ratio of availability payment to utilization. The West Package has a utilization of 69% and the availability payment of IDR 3.486 trillion provides a relatively efficient ratio compared to the Central Package (utilization of 37.67%) and East Package (utilization of 37.38%) which receive higher payments. This ratio indicates that availability payments in areas with low utilization have the potential to be less than optimal in terms of outcomes if not accompanied by increased network utilization. While the high APs of the Central and Eastern Packages reflect compensation for geographical risks and long-term expectations for regional development, it is important for the government to continue to encourage increased utilization so that the payments generate commensurate economic and social benefits. Availability payment schemes that last up to 15 years demand fiscal discipline and continuous evaluation from the government to ensure that payments reflect services that are available and optimally utilized. Without such controls, the risk of fiscal slippage may increase, especially in packages with low utilization.

3.1 Challenges of palapa ring project implementation

The Palapa Ring project, a large-scale telecommunications infrastructure project in Indonesia, faced a number of complex challenges that hindered its implementation. These challenges stem from various aspects, including geographical conditions, security factors, tight timelines and cost factors.

The geographical condition of Indonesia, which consists of many islands and high mountains, is a major challenge in the construction of the Palapa Ring. In eastern Indonesia, such as Papua, rugged and hard-to-reach terrain hampers the delivery of logistics and materials. In addition, Indonesia is located in a tropical region with a humid climate and frequent heavy rains, storms and earthquakes. These conditions can damage the infrastructure that has been built and hinder the development process. Finally, the Eastern Region in particular has mountains with altitudes above 4,000 feet which causes very low oxygen which limits workers to only 1 hour per day.

The Palapa Ring project has a short completion date. The government targets that all project packages should be completed by 2019. However, geographical challenges and natural disasters often cause delays in implementation. For example, although the eastern package was planned earlier, conditions in Papua caused completion to be pushed back to August 2019.

Security factors are also a concern in the implementation of this project. Although communities in some areas, including Papua, are generally supportive of the project, there is potential for disruption that could affect construction. The security of the smooth delivery of materials and the protection of project workers are things that must be taken seriously to ensure the project goes according to plan.

In addition, Center for State Financial Accountability Studies (2022) there are security problems, especially in the eastern package, namely the 174 cases of vandalism of Palapa Ring BTS in 2019-2021 in the form of optical destruction, burning of devices, and threats to East Palapa Ring project workers which caused losses to the implementer to hundreds of billions of rupiah (Helmizar, 2021). However, the provider has taken preventive steps by installing CCTV and electric fences.

The construction of fiber optic infrastructure, especially in remote and hard-to-reach areas, requires a very significant capital investment. This includes material procurement costs (fiber optic cables, active devices), construction costs (excavation, installation, cable pulling), and licensing costs. In addition, according to (Center for State Financial Accountability Studies, 2022) Procurement of consulting services for the Palapa Ring Project Management Unit (PMU) resulted in a waste of state finances of IDR 309,608,697 for the difference in days between the report and reality, the cost of preparing the draft final

report and non-personnel costs that cannot be believed to be reasonable and create a shortage of state revenue from uncollected late fees.

4. Conclusions

The Palapa Ring project stands as a landmark initiative in Indonesia's efforts to strengthen national digital infrastructure through the Public-Private Partnership (PPP) scheme. By implementing availability payment as a funding mechanism, the government successfully collaborated with private partners to construct and operate a vast fiber-optic network reaching even the most remote and underdeveloped regions. This not only reduced the digital divide between urban and rural areas but also laid the foundation for inclusive digital transformation.

The comparative analysis across the three regional packages—West, Central, and East—demonstrates that although all packages contribute meaningfully to national connectivity goals, there remain substantial variations in utilization rates, cost structures, and operational challenges. While the West Package shows relatively high efficiency and utilization, the Central and East Packages face persistent challenges, such as difficult terrain, limited local demand, and high operational costs. These disparities underline the need for targeted policy interventions to increase infrastructure adoption and ensure that digital access translates into actual usage and impact.

However, the finding that AP values exceed the combined capital and operational expenditures raises important questions about fiscal efficiency and risk allocation. Nevertheless, the high operational expenditure (OPEX) in some regions raises concerns about long-term fiscal sustainability and the importance of efficient infrastructure management. From a fiscal perspective, the availability payment (AP) mechanism has been effective in maintaining project continuity by ensuring steady payments over a 15 year operational period. However, the AP values—significantly exceeding the initial capital and operational costs—indicate the need for stronger risk management and better operational efficiency, especially in regions with lower network utilization. In future projects, it may be necessary to adjust the AP scheme design by incorporating more performance-based components that reward actual usage, service quality, or socio-economic outcomes. This ensures that public funds are used more proportionately to the benefits generated, and that private partners remain incentivized to maintain service standards beyond the construction phase.

The results also suggest broader implications for future PP infrastructure projects in Indonesia. First, there is a need for stronger institutional frameworks for monitoring, risk management, and adaptive policy design. Second, infrastructure provision must be coupled with demand-side policies to maximize social and economic returns. To maximize the impact of such projects, it is essential to integrate infrastructure development with community engagement, capacity building, and ongoing digital literacy programs. Strengthening coordination among stakeholders and ensuring continuous performance monitoring are also key to achieving sustainable benefits. Overall, the Palapa Ring project demonstrates the potential of PPP frameworks not only to address infrastructure gaps but also to drive economic growth and social development through digital inclusion. It serves as a replicable model for future infrastructure projects in Indonesia and other developing countries aiming to achieve equitable technological progress.

Acknowledgement

First of all, the authors would like to express their gratitude to God Almighty for His mercy and grace that enabled the authors to complete this article. The authors would also like to thank the various parties who participated in helping the smooth preparation of this article.

Author Contribution

All authors collaboratively developed the research framework and contributed to data collection and analysis. Each author participated in interpreting the findings and refining the manuscript. All authors approved the final version of the article for submission.

Funding

This research received no external funding.

Ethical Review Board Statement

Not available.

Informed Consent Statement

Not available.

Data Availability Statement

Not available.

Conflicts of Interest

The authors declare no conflict of interest.

References

Amalia, P., Suprayogi, Y., Azis, Y., Hermawan, W., Pamungkas, E., Nurzaman, A., & Priyono, A. F. (2021). Analisis dampak ekonomi dan sosial pembangunan infrastruktur di Indonesia. *Journal of Infrastructure Policy and Management (JIPM)*, *4*(1), 1-11. https://doi.org/10.35166/jipm.401.0015

Asosiasi Penyelenggara Jasa Internet Indonesia. (2024). *APJII Jumlah Pengguna Internet Indonesia Tembus 221 Juta Orang.* https://apjii.or.id/berita/d/apjii-jumlah

Aulia, M. H., & Mubarrok, A. Z. (2023). Implementasi Pengembangan Model Bisnis Kerjasama Pemerintah Badan Usaha (Kpbu) Rumah Sakit Pada Perguruan Tinggi Negeri Berbadan Hukum (PTH-BH). *Jurnal Multidisiplin Indonesia*, *2*(9), 2455-2485. https://doi.org/10.58344/jmi.v2i9.469

Badan Pusat Statistik. (2023). *Statistik Telekomunikasi Indonesia 2023.* Badan Pusat Statistik. https://www.bps.go.id/id/publication/2024/08/30/f4b846f397ea452bdc2178b3/statistik-telekomunikasi-indonesia-2023.html

Brodny, J., & Tutak, M. (2022). Digitalization of small and medium-sized enterprises and economic growth: Evidence for the EU-27 countries. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(2), 67. https://doi.org/10.3390/joitmc8020067

Chege, S. M., & Wang, D. (2020). Information technology innovation and its impact on job creation by SMEs in developing countries: an analysis of the literature review. *Technology Analysis & Strategic Management*, *32*(3), 256-271. https://doi.org/10.1080/09537325.2019.1651263

Databoks. (2016). *10 Provinsi dengan Indeks Pembangunan Teknologi Informasi Terendah 2015.* https://databoks.katadata.co.id/teknologi-telekomunikasi/statistik/e50331cdf28deff/10-provinsi-dengan-indeks-pembangunan-teknologi-informasi-terendah-2015

Databoks. (2016). 2015, Pembangunan TIK Indonesia Masuk Kategori Sedang. https://databoks.katadata.co.id/teknologi-telekomunikasi/statistik/57345c0cf080b7a/2015-pembangunan-tik-indonesia-masuk-kategori-sedang

Dwiputra, A. R., Maulana, D. A., Nurzamilah, Z., Pambudi, A. P., Nurpulaela, L., & Andromeda, S. (2025). Peran Fiber Optik Dalam Revolusi Teknologi Jaringan Telekomunikasi. *JATI (Jurnal Mahasiswa Teknik Informatika)*, *9*(1), 1657-1663. https://doi.org/10.36040/jati.v9i1.12280

Eschachasthi, R., Purwa, T., & Cendekia, D. G. (2021). Does Palapa Ring Project Infrastructure Bridging Connectivity and Economic Activity?. In *Proceedings of The International Conference on Data Science and Official Statistics* (Vol. 2021, No. 1, pp. 418-435). https://doi.org/10.34123/icdsos.v2021i1.99

Fachrurrozi, N. (2019). Analisa Kelayakan Capital Budgeting Jaringan Backbone Kabel Serat Optik Palapa Ring Studi Kasus : Palapa Ring Barat. *InComTech:Jurnal Telekomunikasi dan Komputer, 9*(2), 87-114. http://dx.doi.org/10.22441/incomtech .v9i2.6472

Fathimatuzzahra, R. N., & Dompak, T. (2024). Menjembatani kesenjangan akses internet: Studi kasus Indonesia dan Brunei Darussalam. In *Prosiding Seminar Nasional Ilmu Sosial dan Teknologi (SNISTEK)* 6, 147-153. https://ejournal.upbatam.ac.id/index.php/prosiding/article/view/9322

Haryadi, A., Rokhmawati, A., & Indrawati, N. (2022). Analisis Value for Money pada Evaluasi Kelayakan Investasi Infrastruktur Publik Kerjasama Pemerintah Badan Usaha Sistem Penyediaan Air Minum Kota Pekanbaru (KPBU SPAM Kota Pekanbaru). *Jurnal Daya Saing*, *8*(3), 369-383. https://doi.org/10.35446/dayasaing.v8i3.960

Helmizar. (2021). *Problem Teknis dan Akuntabilitas Pelaksanaan Program Palapa Ring.* https://berkas.dpr.go.id/pa3kn/analisis-tematik-akuntabilitas/public-file/analisis-ringkas-cepat-public-29.pdf

Kartikasari, M. D., & Retnaningsih, S. (2024). Kajian Mengenai Skema KPBU Melalui Perjanjian KPBU IKN. *Ranah Research: Journal of Multidisciplinary Research and Development*, *6*(4), 933-941. https://doi.org/10.38035/rrj.v6i4.899

Khaira, A., & Ariusni, A. (2020). Analisis Kausalitas Infrastruktur Telekomunikasi, Pertumbuhan Ekonomi dan Pembangunan Ekonomi di Indonesia. *Jurnal Kajian Ekonomi Dan Pembangunan*, *2*(1), 17. http://dx.doi.org/10.24036/jkep.v2i1.8795

Kominfo. (2024). *Financial Close Penandatanganan Perjanjian Kerjasama Proyek Palapa Ring*. https://www.kominfo.go.id/berita/berita-pemerintahan/detail/financial-close-penandatanganan-perjanjian-kerjasama-proyek-palapa-ring

KPPIP. (2022). Palapa Ring Broadband. https://kppip.go.id/proyek-prioritas/teknologi-informasi/palapa-ring-broadband/

Labirin. (2023). *Utilasi proyek Palapa Ring capai 60%.* Labirin. https://v1.labirin.id/news/39828/utilasi-proyek-palapa-ring-capai-60

Lestari, G. A., Pradiastiwi, P., Putri, I. K. & Parhusip, J., 2024. Analisis Statistik Telekomunikasi Indonesia Tahun 2020: Tren, Perkembangan, dan Implikasi terhadap Transformasi Digital. *Jurnal Penelitian Multidisiplin Terpadu, 8*(12), 76-79. https://sejurnal.com/pub/index.php/jpmt/article/view/5440/6383

Maulana, M. R. (2021). Pemahaman dan Pembelajaran Tahap Perencanaan dan Penyiapan Pembangunan Infrastruktur di Indonesia Melalui Skema Kerja Sama Pemerintah dan Badan dalam Penyediaan Infrastruktur (KPBU). *JISIP (Jurnal Ilmu Sosial Dan Pendidikan)*, *5*(1), 1-22. http://dx.doi.org/10.58258/jisip.v5i1.1646

Mirabito, M., & Morgenstern, B. (2004). *The New Communications Technologies: Applications, Policy, and Impact*. Routledge. https://doi.org/10.4324/9780080470184

Nugraha, E., Yulia, A., & Prasetyo, A. (2020). Evaluasi dan perbaikan proses bisnis proyek Palapa Ring (PARING) menggunakan metode Business Process Improvement (BPI):

Studi kasus Badan Aksesibilitas Telekomunikasi dan Informasi. *Jurnal Ilmiah Teknologi Informasi (JITI), 4*(3), 717-722. https://j-ptiik.ub.ac.id/index.php/j-ptiik/article/view/7032

Prayoga, A., Simanjuntak, D. G. F., Seda, F. T. A., & Parhusip, J. (2024). Analisis Perbedaan Pembangunan Teknologi Informasi pada Bidang Ekonomi. *Jurnal Ilmiah Informatika dan Komputer*, *1*(2), 163-169. https://doi.org/10.69533/psar3e79

Susanti, S. (2024). Kerjasama Investasi Antara Pemerintah Dengan Badan Usaha Menggunakan Model Build Operate Transfer (BOT) Dalam Pembangunan Infrastruktur di Indonesia. *Jurnal Intelek Dan Cendikiawan Nusantara*, *1*(2), 2414-2425. https://jicnusantara.com/index.php/jicn/article/view/260

Tasueva, T. S., Idigova, L. M., & Rakhimova, B. K. (2021). Information and Communication Technologies in the Formation of Digital Regional Infrastructure. *European Proceedings of Social and Behavioural Sciences*, *117*, 1512. https://doi.org/10.15405/epsbs.2021.11.199

Wahab, N. A., Nayan, S., & Yong, K. C. (2020). Internet user and economic selected Southeast Asia nations: A panel data analysis. *Journal of Emerging Economies and Islamic Research*, *8*(3), 17-25. https://doi.org/10.24191/jeeir.v8i3.8952

Biographies of Authors

Putri Maziya Ikhsanti, Department of Economics, Faculty of Economics and Business, Brawijaya University, Malang, 65141, Indonesia.

- Email: maziyaputri26@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A

Nicky Arnezti, Department of Economics, Faculty of Economics and Business, Brawijaya University, Malang, 65141, Indonesia.

- Email: nickyarnezti42@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A

Denisya Ziva Alika, Department of Economics, Faculty of Economics and Business, Brawijaya University, Malang, 65141, Indonesia.

- Email: denisyaziva1@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A