UNLOCKING PRIVATE INVESTMENT BY EXPANDING THE SCOPE OF EXISTING TOLL ROAD PPPs AGREEMENTS

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Abstract - The inability of governments in many developing countries to provide basic infrastructure has encouraged the adoption of Public Private Partnership (PPP) schemes. However, many developing countries fail to attract sufficient private investment from the PPP market. This paper develops alternative schemes that can minimize the funding gap and promote sustainable infrastructure investment through modified PPP agreements at later stages of the project life cycle by making special tariff adjustments on existing toll roads. To answer research questions, both conceptual model development and empirical analysis are utilized. The study collects both quantitative and qualitative data for analysis and interpretatio. The results indicate that expanding the scope of existing PPP agreements increases the net present value as it allows for larger cash inflows at the start, leading to a faster payback period. Additionally, this scheme reduces the need for cash deficiency support during the initial period of operation. The alternative schemes encourage lower support for government subsidies, offer a reasonable tariff for users, and provide an attractive investment return for private interests.
Keywords: Public Private Partnership; Concession Agreement; Toll Road; Sustainable Investment, Funding Gap

1. INTRODUCTION

1.1 Background

During the first half of 2022, the top five countries receiving the largest Private Participation in Infrastructure investments in absolute terms were China, India, Brazil, Indonesia, and Vietnam. The transport sector continued to be the leading recipient of during the same period. The roads subsector within the transport industry received the highest level of investment commitments, totaling US$21.7 billion. The majority of global road investments were made in China totaling US$10.6 billion, followed by Indonesia with US$3.9 billion. (World Bank, 2021).

At present, there is still a financing gap between existing needs and the funding capability of the Government (Asian Development Bank, 2017). However, with growing fiscal deficits and other budgetary constraints in Asia, it is essential to develop alternative sources of investment for infrastructure projects.

Investments in infrastructure such as toll roads have a long return on investment with an average of up to 60 years (Rickards, 2008). In addition, infrastructure projects have a relatively long period of negative cash flow compared to other industries because they have the character of a slow increase in cash flow at the start of operations due to relatively large interest payments

on loans and the uncertainty of income (Pokorná & Mocková, 2001). There are several obstacles in the implementation of PPPs in developing countries, one of which is the high fees charged to infrastructure users (Ismail & Haris, 2014). In order to balance the interests of business entities and users, it is necessary to identify some of the main things in the cooperation agreement, such as the concession period, initial tariff, proportion of capital structure, and government assistance (Feng et al., 2018).

Different types of Government support can attract more corporate investment. Based on previous research, government support in the form of capital, income and also subsidies in the form of goods provided directly from the government attracts more business entities to undertake PPP operations, while indirect support through government guarantee policies has no effect. In addition, the quality of a country's institutions increases the positive relationship between government direct support and PPP investment and the distribution of risk allocation plays a mediating role between government support and investment in business entities (Huanming et al., 2019). Direct government support with guaranteed income for infrastructure projects will benefit both business entities and infrastructure users. Business entities are confident of return on investment and at the same time infrastructure users can enjoy more facilities with lower rate (Pokorná & Mocková, 2001).

In the PPP scheme in toll road construction, tariff setting for users is influenced by the user's Ability to Pay and Willingness to Pay as well as the return on investment by business entities. In terms of return on investment, business entities in PPPs have 3 (three) payment mechanisms: by imposing fees on infrastructure users, payments by the government or both combination (David et al., 2003).

According to Bhajan (2022), to unlock private participation in infrastructure investment, based on lessons from across Asia, among the proposed schemes are government tax incentives, development-based land value capture strategy under PPP land pooling, Viability Gap Funds, Project Development Facilities, and other guarantees. While Rahman (2019) mentioned that proposed Private *participation* with unbundling scenarios during operation and maintenance stages are worthy of comprehensive research to cope with recovery of public investment and institutionalization problems.

Based on the website page of the Toll Road Regulatory Agency, in Indonesia, toll roads built before 2000 have an average fare of less than IDR 500 per kilometer, while toll roads built after 2015 have an average fare of more than IDR 1,000 per kilometer, there are even toll roads with rates per kilometer above IDR 2,000.00. Most of the toll roads built before 2000 were in big cities such as Jakarta, Surabaya, Bandung, Medan and others. While the toll roads that were built after that were mostly inter-city toll roads that passed through smaller cities such as Pemalang, Batang, Ngawi, Pasuruan, Terbanggi Besar with lower average per capita incomes. This can lead to less-than-optimal direct use of toll roads by the surrounding community in these small towns. On the other hand, there is potential to maximize the ability to pay toll road users in large urban areas by increasing the fees charged to users of toll roads built earlier. The increase in tariffs can be used to develop new toll roads.

This paper contributes to the literature by discussing the potential for financial support from ongoing PPP projects to support new toll road project, so that it scheme can encourages lower support for government subsidies, offers a reasonable tariff for the users and recommend an attractive investment return for private interest. Based on Indonesian regulations, it is possible to increase the tariff of certain toll roads to support the development of new toll roads.

Perusahaan The Body Shop terkenal dengan produk ramah lingkungannya. Tetapi, pada penelitian yang dilakukan oleh Rakhmawati (2019), dalam penelitiannya yang berjudul pengaruh *green product, green brand* dan *green advertising* terhadap keputusan pembelian

produk The Body Shop di Kota Yogyakarta, disebutkan bahwa *Green Product* tidak berdampak positif dan signifikan terhadap keputusan pembelian konsumen The Body Shop dikarenakan objek penelitian yang digunakan adalah produk kosmetik yang ramah lingkungan. Produk kosmetik sendiri tidak memiliki manfaat secara langsung dalam waktu jangka pendek karena produk kosmetik sendiri tidak dapat memberikan perbedaan dengan jelas dalam waktu pendek. Selain itu, konsumen juga lebih cenderung untuk memperhatikan merek produk daripada produk ramah lingkungan itu sendiri. Sehingga penelitian ini dilakukan dengan tujuan untuk mengetahui perilaku pembelian produk ramah lingkungan khususnya konsumen The Body Shop yang berdomisili di Jakarta, Tangerang, Depok, Bekasi dan Bogor.

1.2 Literatur Review

In recent years, governments have turned to public-private partnerships (PPPs) as a means to overcome budgetary limitations in the delivery and management of public services and infrastructure, according to Cruz and Marques (2013). A PPP is defined as a collaboration between the government and private sector to provide infrastructure to the public, involving shared or redistributed risks, costs, benefits, and resources throughout the design, construction, and operation of the project, as stated by Koppenjan (2005). The PPP approach aims to combine the strengths of both sectors in order to find solutions to problems. The private sector can offer financial assets, advanced management, innovation, and entrepreneurship, while the public sector can innovate and accelerate each stage, such as through the design and build scheme.

Additionally, business entities in PPPs can efficiently control costs to boost profitability, as noted by Quinn (1985). Yescombe and Farquharson (2018) highlight the key elements that constitute the framework of PPPs. First and foremost, PPPs are characterized by long term agreements between private and public entities. These agreements cover funding, design, construction, and operation of public facilities, which are mostly financed by the private sector. In return, private parties receive a return on their investment through payments made by the public or the government as users of the facilities or both. At the end of the PPP agreement, public facilities are returned to the government. PPPs also involve risk-sharing between the government and the public sector, highlighting the importance of collaboration in such partnerships.

Yescombe (2002) describes Concession Agreements as a common approach for projects that provide specific services to the public or government, typically utilizing schemes such as Build-Operate-Transfer (BOT), Build-Transfer-Operate (BTO), and Design-Build-Finance-Operate (DBFO). Although these approaches share certain similarities, they differ in significant ways. In BOT, the private sector is responsible for designing, constructing, operating, and financing a public facility, with payments collected during the concession agreement. Conversely, BTO involves the private sector building a facility for a government agency, which is leased for a long-term period, during which the government operates the facility and generates profit from user fees. In a DBFO contract, the private sector is responsible for all aspects of the project, from conception to completion, maintenance, and funding, with the public sector paying the private sector for specific services throughout the project (Cruz & Marques, 2013; Koppenjan, 2005; Wang & Zhao, 2018; Yescombe & Farquharson, 2018).

PPPs provide potential benefits for both public and private sectors. Private entities are typically focused on achieving a desirable return on investment and generating profits. In contrast, the public sector is concerned with limiting risk and increasing societal value through collective decision-making that reflects public opinion (Cruz & Marques, 2013). According to Alexandersson & Hulten (2009), private sector entities may benefit from access to new venture activities, generate greater margins, and achieve more long-term income through PPPs.

Project financing is a method of determining long-term debt financing for large projects through financial engineering. Project financing is used to determine funding requirements at the start of and during project operation by taking into account the cash flows generated by the project in the form of revenues and the need for construction, operating costs, as well as the allocation of funding by investors, lenders and other parties through contracts and other arrangements. In general, large-scale public sector projects are financed by debt. With limited funding and loans that can be made by the Government, this approach is starting to change, with efforts to privatize and change regulations by encouraging project financing to be carried out by private companies through Public Private Partnership (PPP) (Yescombe, 2018). According to Yescombe (2018), project financing has the following characteristics:

1. The project will be run by a company specifically set up to manage the project.
2. The ratio of using debt is much higher than equity.
3. Used for new projects.
4. The lender will assess the project and calculate the project's ability to generate income for principal and loan interest payments.
5. Lenders will provide loans at a lower value than the value of tangible assets, so that the sale of these tangible assets is expected to return the principal and loan interest in the event of default on the Project.

The need for infrastructure development in the world from 2016 to 2040 averages USD 3.76 trillion per year, of which 54% is in the Asian Continent followed by the Americas at 22%. In order for these needs to be met, the portion of infrastructure development needs to be increased to 3.5% of GDP (Asian Development Bank, 2017). According to the Asian Development Bank, the need for funding for infrastructure in the Asian region is USD 1.7 trillion per year by 2030. However, currently there is still a financing gap between the existing needs and the funding capabilities of the Government (Asian Development Bank, 2017).

As a result of this gap, Public Private Partnership (PPP) for financing infrastructure projects is growing rapidly in the world. PPPs can help fill gaps in infrastructure funding needs (Asian Development Bank, 2017). For India, more than 65% of its infrastructure projects are through PPP schemes (Freidina, 2017).

Investments in infrastructure such as toll roads have a long return on investment with an average of up to 60 years (Rickards, 2008). In addition, infrastructure projects have relatively long periods of negative cash flow compared to other industries because they have a slow increase in cash flow at the start of operations due to the relatively large interest payments on loans and the uncertainty of income (Pokorná & Mocková, 2001). In addition, there are several obstacles in the implementation of PPPs in developing countries, one of which is the high fees charged to infrastructure users (Ismail & Haris, 2014). In order to balance the interests of business entities and users, it is necessary to identify some of the main things in the cooperation agreement, such as the concession period, initial tariff, proportion of capital structure, and government assistance (Feng et al., 2018).

In Project investment decisions, it is necessary to analyze the value of cash flows in the future and consider the degree of uncertainty over cash flows. Generally, there are several analytical techniques used to evaluate long-term asset investment decisions, such as net present value, internal rate of return, profitability index, payback period and discounted payback period (Ross et al., 2008). Net Present Value (NPV) is a method used to evaluate the feasibility of a project, considering the time value of money (Ross et al., 2019). NPV represents the difference between expenditures and income, which is discounted using a specific discount rate to obtain the present value of future cash flows. If the NPV is greater than zero, the project can be accepted, while a negative NPV indicates that the project investment should be rejected.

Internal Rate of Return (IRR) is a value when discount investment costs and net cash flows throughout the project results an NPV of zero (Damodaran, 2001). A project is considered viable if the IRR is greater than the rate of return available from alternative investments (such as interest on bank deposits or mutual funds).

According to Peterson and Fabozzi (2002), the profitability index (PI) is calculated to determine the rate of return obtained for each specific amount invested. The PI is the ratio of the present value of future net cash flows to the total initial investment costs (Ross et al., 2008).

The payback period, as defined by Peterson and Fabozzi (2002), is the time required to recover the initial investment. A shorter payback period is generally preferable as it indicates faster cash flow returns. However, a shorter payback period alone does not guarantee a better investment decision, and further analysis is needed to make an informed investment choice.

Different types of Government support can attract more corporate investment. Based on previous research, government support in the form of capital, income and also subsidies in the form of goods provided directly from the government attracts more business entities to undertake PPP operations, while indirect support through government guarantee policies has no effect. In addition, the quality of a country's institutions increases the positive relationship between government direct support and PPP investment and the distribution of risk allocation plays a mediating role between government support and investment in business entities (Huanming et al., 2019). Direct government support with guaranteed income for infrastructure projects will benefit both business entities and infrastructure users. Business entities are confident of return on investment and at the same time infrastructure.

According to Bhajan (2022), to unlock private participation in infrastructure investment, based on lessons from across Asia, among the proposed schemes are government tax incentives, Viability Gap Funds, Project Development Facilities, and other guarantees. Government tax incentives are measures implemented by the government to reduce the tax burden for businesses and investors to encourage private sector participation and investment in infrastructure projects. These incentives, which can take the form of tax reductions, exemptions, or credits, aim to stimulate economic growth and development by making infrastructure investments more financially attractive.

Viability Gap Funds (VGF) are financial instruments introduced by the government to address the viability gap that often exists in infrastructure projects. The viability gap refers to the difference between the total cost of a project and the expected revenue or funds it can generate. Infrastructure projects may face challenges in attracting private investment due to high upfront costs, uncertain revenue streams, or long gestation periods. Viability Gap Funds aim to bridge this gap by providing financial support or subsidies, making the projects more financially viable and enticing for private investors to participate.

Project Development Facilities (PDFs) are specialized entities or institutions established by the government or other stakeholders to support the development of infrastructure projects. These facilities offer a range of services and resources, including technical expertise, financial advisory, project management, feasibility studies, and capacity building. PDFs play a crucial role in project preparation, structuring, and implementation, helping to mitigate risks, improve project viability, and attract private sector involvement. They serve as intermediaries, bridging the gap between project concept and financial closure, and contribute to enhancing project bankability and reducing barriers for private sector investment in infrastructure.

This research is discussing the potential for financial support from ongoing PPP projects to support new development project to minimize direct government support. In addition, with this scheme, it is hoped that the tariffs applied will be fairer and investors will also be interested in better financial returns. Based on the regulations in force in Indonesia, the policy to increase

the fares paid by toll road users on certain toll road sections to develop new toll roads can be implemented.

2. RESEARCH METHODOLOGY

This chapter describe the methods used to meet the research questions and objectives. The sequence of this research is that first it will make a theoretical conceptualization of the financial impact on a project with a PPP Scheme. This conceptualization is carried out by means of a literature study and further impact analysis on projects with PPP schemes.

Initially, a set of research questions will be developed to guide the investigation. These questions are designed to explore various aspects of the research topic and provide a framework for data collection and analysis.

Case studies will be carefully selected based on a preliminary assessment of several key criteria. This selection process will ensure that a suitable project with a public-private partnership (PPP) can be used as a representative case study.

Data collection will involve a combination of primary and secondary sources. Literature studies will be conducted to gather relevant information from academic journals, books and other published sources. Interviews will also be conducted with industry experts and stakeholders to obtain insights and gather primary data. These interviews will provide valuable information on the initial investment, operating and maintenance costs, traffic volume, growth trends and toll rates.

Once the data is collected, a thorough analysis will be carried out. Quantitative analysis will involve the examination of numerical data, such as financial figures, traffic data and cost projections. This analysis will be complemented by qualitative analysis, which will involve the interpretation of interview responses, case study findings, and literature review findings. The combination of both qualitative and quantitative analyzes will provide a comprehensive understanding of the research topic.

Overall, the research process will involve a meticulous selection of case studies, collection of primary and secondary data, and a rigorous analysis of the gathered information. This approach will ensure a comprehensive investigation and enable researchers to address research questions and draw meaningful conclusions.

2.1 Research Strategies

This study used both qualitative and quantitative approaches to enable the use of a wider range of data collection tools. To identify the conceptual model that has been prepared regarding the potential costs and benefits of developing a new toll road if it becomes part of an additional PPP scope compared to a new PPP. In addition, this involves in-depth case studies of PPP projects to gain an overview of the problems and examine real-world practices from various perspectives. Then, evaluate the impact assessment implications of the construction of a new toll road if it becomes part of an additional PPP scope compared to a new PPP. By further examining the quantitative and qualitative analysis so that it becomes input for building discussions and recommendations to improve the implementation of PPP in Indonesia.

2.2 Data Collection

In this study, primary data and secondary data used by conducting literature reviews and interviews. In this case, it was obtained from the Toll Road Regulatory Agency of the Ministry of Public Works and Public Housing, PT Jasa Marga (Persero) Tbk, PT Jasamarga Semarang Batang. The data includes the initial investment, operating and maintenance expenses, traffic

volume, growth in traffic volume, toll fare. In addition, interviews will be conducted to obtain the assumptions used in the calculation analysis.

2.2.1 Literature Study

The literature review used scientific papers, laws and regulations in Indonesia, publications from the Ministry of Public Works and Public Housing, publications by PT Jasa Marga (Persero) Tbk and publications from international institutions such as the World Bank and the Asian Development Bank. A literature review was conducted to be able to develop a conceptual framework and develop a thesis analysis framework. In addition, a literature review was carried out in compiling research questions.

2.2.2 Semi-structured interview

The interview was conducted using a semi-structured interview method. In semi-structured interviews it is possible to be flexible in asking questions while adjusting towards the research objectives (Ruslin et al., 2022).

In selecting sources, this study has two criteria that must be met to ensure that the information provided is relevant to the research subject. The first is selecting individuals from organizations that implement toll road projects under the PPP scheme. Furthermore, for the second criterion, the resource person has been directly involved and has the ability to manage and operate a PPP project.

Prospective respondents were assigned to four business entities, PT Jasa Marga (Persero) Tbk and PT Hutama Karya (Persero) as private parties that control 74% of toll road operations in Indonesia until December 2021. In addition, interviews were also conducted with private parties who had operating relatively new toll roads under the PPP scheme PT Jasamarga Semarang Batang and PT Jasamarga Jalanlayang Cikampek.

2.3 Case Study

In this research, a case study will be carried out on toll roads owned by the Jasa Marga Group. The selection of Jasa Marga Group is because Jasa Marga Group owns 51% of toll roads operating in Indonesia until 31 December 2021 (PT Jasa Marga (Persero) Tbk, 2022).

The second largest market share holder in Indonesia is PT Hutama Karya (Persero) which received an assignment from the Government of Indonesia to carry out the construction of the Trans Sumatra Toll Road (PT Hutama Karya (Persero), 2022).

Based on several sources, general information regarding the project that will be used as a case study is as follows:

Table 1. Case Study Collection

Toll Road Segment	Length (km)	Revenue (2022)	Private Entity
Jakarta Tangerang	26,3	Rp 955 billion	PT Jasa Marga (Persero) Tbk
Semarang Batang	75	Rp 999 billion	PT Jasamarga Semarang Batang

Source: www.jasamarga.com (2022)

Jakarta Tangerang Toll Road will be a toll road whose scope will be added (**Existing Toll Road**). Meanwhile, the Semarang Batang Toll Road will be a toll road that will be a sample of the New Toll Road whose scope will be added (**New Toll Road**). The selection of this project is based on an initial assessment of several main criteria to determine whether a project qualifies as a PPP. As discussed in the literature review, PPP contracts are long-term agreements between public and private parties that can be fulfilled due to the projects are

implemented under concession agreements of 40 to 50 years. In addition, this collaboration includes planning, construction, operation and maintenance of toll roads under the BOT.

2.4 Data Analysis

The analysis will be carried out by conducting in-depth case studies on toll road PPP projects in Indonesia. Case studies are conducted to get a clear picture of a problem, as well as examine the implementation of toll road PPPs in Indonesia from various angles and perspectives. Collecting and merging quantitative data is done to find interpretations and to understand certain situations (Sekaran & Bougie, 2016). In addition, interviews will be conducted to investigate qualitative information about the assumptions and aspects that affect the financial feasibility of toll road projects under the PPP scheme.

Our analysis will involve the development of a comprehensive business plan specifically for the New Toll Road. This plan will encompass various critical factors, including investment costs, tariff structure, projected traffic volume, operating and maintenance costs (OM), and other relevant expenses. By considering these elements, we will determine the Internal Rate of Return (IRR) for the toll road project (S1). Utilizing the financial model S1, we will make necessary adjustments to the tariff rates based on the value of willingness to pay (WTP), as well as make appropriate modifications in traffic volume and OM costs. This will result in the calculation of a new IRR for the toll road (S2). Using the financial model derived from scenario S2, we will proceed to assess the additional revenue required to attain the IRR obtained in scenario S1. This additional revenue will be generated by implementing tariff adjustments on the existing toll roads. This comprehensive analysis will allow us to compare the financial implications and outcomes between the two scenarios.

Finally, we will compare the financial impact of the two scenarios, considering the differences in projected revenue, costs, and overall feasibility. This analysis will provide valuable insights into the potential financial outcomes of the toll road project under different scenarios.Compare the NPV, Payback period and cash deficiency support from the the analysis.

The results of the two analyzes can then be found in several recommendations which are expected to provide an alternative to the new PPP scheme

Then, an evaluation will be carried out on the implications of assessing the financial impact of the construction of the New Toll Road by increasing the scope of the PPP compared to the new PPP agreement. To be able to answer this question, further qualitative and quantitative analysis will be carried out. The results of the two analyzes can then be found in several recommendations which are expected to provide an alternative to the new PPP scheme.

A feasibility study is an activity carried out to study an activity or business to be carried out, to be able to determine the feasibility level of the business (Kasmir & Jakfar, 2003). An important feasibility study is carried out to assess whether each proposed project is feasible or not (Mintzberg, 1976). The approach used to evaluate the feasibility of toll road construction with a PPP scheme can be carried out in the following stages (Horne, 1974):

a. Determine the concession period.
b. Estimating project cash flow.
c. Determine the discount rate.
d. Establish project evaluation by establishing criteria for accepting or rejecting a project.
e. Perform sensitivity or uncertainty analysis.
f. Accept or reject projects based on predetermined criteria.

Quantitative analysis for evaluating the implications of assessing the financial impact of the construction of a new toll road with an additional scope on the PPP compared to the construction of a new toll road with a new PPP agreement is carried out in the following stages:

a. Create a financial model of the New Toll Road sections based on cash flow data and cash flow projections to obtain the project IRR for these toll roads.
b. Using financial model above, changing the tariff according to the WTP and traffic volume then a new IRR is obtained for these toll roads.
c. By using the financial model above, the calculation of revenue on the Od Toll Road is carried out as entrusted revenue from the new toll road to achieve the IRR as in point a above.
d. Compare the NPV, Payback period and cash deficiency support from the the analysis in point a and point c.
e. The results of the two analyzes can then be found in several recommendations which are expected to provide an alternative to the new PPP scheme.

3. RESULT AND DISCUSSION

Findings from the results of semi-structured interviews, observations, and secondary data will be compiled to assess the financial impact of the construction of the New Toll Road if it becomes part of the additional scope of the old PPPs agreement compared to the new PPP agreement. This research will use a case study on the concession of the Semarang-Batang Toll Road. This toll road section has been built through a PPP scheme with a new PPP agreement. However, to carry out simulation calculations if the intended section becomes an additional scope of the PPP, several approaches are carried out to estimate the amount of investment costs, tariffs, traffic volume, growth in traffic volume, operating and maintenance costs and other investment parameters that affect such as inflation, interest rates, allocation of resources. The Semarang-Batang Toll Road concession will be simulated if the scope is added to the Jakarta-Tangerang Toll Road Concession. Apart from that, a sensitivity and scenario analysis will also be carried out with the variable amount of investment costs, traffic volume, and tariffs to test the effect on the feasibility of the toll road.

3.1 Qualitative Analysis

Qualitative analysis was carried out by conducting semi-structured interviews with several informants who have experience and expertise in toll road operations in Indonesia.

3.1.1 Interview process

Interviews were conducted with 7 informants, originating from organizations that own most toll road concessions in Indonesia, Jasa Marga Group and PT Hutama Karya (Persero). The list of sources is presented in the table below.

Table 2. Interviewee

Kode	Institution	Role
P1	PT Hutama Karya (Persero)	Director of Finance and Risk Management
P2	PT Jasa Marga (Persero) Tbk	Concession Business Planning Group Head
P3	PT Jasa Marga (Persero) Tbk	Concession Business Planning Senior Specialist
P4	PT Jasamarga Jalanlayang Cikampek	General Manager Maintenance and Operation
P5	PT Jasamarga Semarang Batang	General Manager Maintenance and Operation
P6	PT Jasamarga Semarang Batang	Manager Maintenance
P7	PT Jasa Marga (Persero) Tbk	Business Development Group Head

Interviews with informants were arranged in the order of their interview schedule, in which this sequence was to show the sequence of information collected during the research. The main informants in this study were the Business Development Group Head of PT Jasa Marga (Persero) Tbk, the Concession Business Planning Group Head of PT Jasa Marga (Persero) Tbk and the Director of Finance and Risk Management of PT Hutama Karya (Persero). The interview began with the Director of Finance and Risk Management of PT Hutama Karya (Persero) and the Concession Business Planning Group Head of PT Jasa Marga (Persero) Tbk who have a primary interest in financial impact and to gain insight from key players in the private sector. Furthermore, interviews were conducted with private parties who are experienced in the operation and maintenance of toll roads to validate the assumptions used in the quantitative analysis.

Finally, an interview was conducted with the Business Development Group Head who has experience with PPP projects and has responsibility for obtaining additional toll road concessions under the PPP scheme. Interviews with the Business Development Group Head were conducted lastly after obtaining perspectives from all sources to validate and verify from several aspects.

3.1.2 Coding and Data Analysis

Each subsequent interview will be transcribed separately for further analysis. The coding process uses the predefined list of codes in Chapter 3 about the potential impact of the theoretical conceptual model. The code list can be seen in the table below.

Table 1. Coding Data

No	Code
1	Construction cost
2	Lower government support
3	Higher transaction costs
4	Higher operation and maintenance cost
5	Higher revenue
6	Lower toll fare

3.1.3 Interview Results

Construction Costs

A new toll road becomes part of an additional PPP agreement compared to a new PPP agreement have the same construction costs (P1, P7, P2, P5). It because the design and construction provisions already have a common standard (P1, P5). In addition, the construction design requires government approval prior to construction and the construction period has been agreed in the Toll Road Concession Agreement so that strict regulation and supervision does not allow for differences in construction costs with the scheme (P5).

Lower government support

A new toll road becomes part of an additional PPP agreement has a lower potential for government support (P1, P3). It because it is possible to have cash flow support from the Existing Toll Road by intervening in toll fare and/or the concession period (P1, P2, P5). The addition of a toll fare creates higher income that can support New Toll Road cash flow (P1). Meanwhile, with the addition of concessions, additional revenue will be obtained after the old toll road concession period ends (P1). By combining additional tariffs and concessions results lower toll fare.

However, increasing toll fare are limited by considering tariff sensitivity (P3, P5). To optimize toll fare and additional cash, tariff interventions can be carried out in stages and with the addition of concessions so that the cash acquisition period becomes longer (P1.P2).

Effect of Traffic Volume, Operation and Maintenance Costs, and Toll Revenues

A new toll road fare in additional PPP agreement scheme can be reduced so traffic volume on the new toll roads will be increase (P1, P4, P5). It supposed to user demand and ability to pay or willingness to pay (P1, P5).

With the addition of traffic volume, it is likely that the costs of operating and maintaining new toll roads will increase (P1, P4, P5, P6). However, the increase in operating and maintenance costs is lower than the increase in traffic volume because some expenses are not affected by traffic volume (P4, P5).

When Existing Toll Road increase toll fare to support the cash flow of the New Toll Road, the traffic volume will decrease (P1, P5) because several road users used an alternative road, especially in short distances (P1). But it less sensitivity than New Toll Road (P1, P5) because toll fare in Existing Toll Road below willingness to pay or ability to pay the road users (P1). Existing Toll Road can support the new one due to its higher traffic volume. Moreover, increasing toll fare to support the cash flow of the New Toll Road minimize the risk. Because Existing Toll Road less sensitivity in increase toll fare and has historical traffic, so easily to predict the traffic volume than the new one.

Transaction Costs

A new toll road becomes part of an additional PPPs agreement require higher transaction cost, but insignificant amounts (P1, P3, P5). This extra cost is required in negotiating the revenue sharing after toll fare increase in Existing Toll Road. The negotiations are also possible if Existing Toll Road proposes extra costs or extra revenue due to toll collection held by Existing Toll Road, and this scheme risks reducing traffic volume which potentially decrease Existing Toll Road revenue in the future. (P1, P5). The extra cost and revenue sharing tends to be proposed if the share ownership is different. Moreover, extra costs are required in monitoring of revenue split between each party (Existing Toll Road and New Toll Road) (P1, P3, P4, P5).

3.2 Quantitative Analysis

Quantitative analysis will be carried out by analyzing the financial impact of the new toll road becomes part of an additional PPPs agreement or new PPPs agreement in terms of net present value, payback period, cash deficiency support. This research selected the Semarang-Batang Toll Road as the case study. This toll road is constructed under the new PPPs agreement. Therefore, several approaches are carried out to estimate the investment costs, toll fare, traffic volume, traffic growth, operating and maintenance costs and other investment parameters that affect such as inflation and interest rates.

3.2.1 Data Collection

Considering that the Semarang-Batang Toll Road has been fully operated, the investment costs, concession period, operation and maintenance costs, toll revenues, traffic volume, tariff rates, company operating profit until 2022 are known based on the Annual Report of PT Jasa Marga (Persero) Tbk. from 2016 to 2022. Apart from that, the calculation assumptions were also obtained from the results of interviews and other secondary data. The reference data is as shown in Table 4.

Table 2. Investment Parameters

No	Description	Value	Reference
1.	Length (km)	75	*Annual Report* Jasa Marga 2016
2.	Initial Toll Fare (Rp)	75.000	https://jtt.jasamarga.com/
3.	Investment Cost (Rp billion)	12.832,456	*Annual Report* Jasa Marga 2018
4.	Construction Period	2016 - 2018	*Annual Report* Jasa Marga 2018
5.	Concession Period	50 years	*Annual Report* Jasa Marga 2019

Source: www.jasamarga.com (2022)

The Annual Report of PT Jasa Marga (Persero) Tbk shown Semarang-Batang Toll revenue, traffic volume and operating profit. This data is used to calculate revenue and validate the calculation of operating and maintenance costs as shown in Table 5.

Table 3. Operating Profit Semarang-Batang Toll Road (Rp million)

No	Year	Revenue	Operating Costs	Operating Profit	Reference
1.	2019	670,382	271,512	398,870	*Annual Report* Jasa Marga 2019
2.	2020	721,331	293,540	966,070	*Annual Report* Jasa Marga 2020
3.	2021	834,875	317,084	650,960	*Annual Report* Jasa Marga 2021
4.	2022	999,493	337,605	661,888	*Annual Report* Jasa Marga 2022

Source: www.jasamarga.com (2022), Processed

Based on the interviews results and ATP/WTP studies, when New Toll Road fare adjusted to the WTP, the traffic volume will increase. Meanwhile, the main differences of New Toll Road become part of the additional scope of the PPP agreement (S2) compared to the new PPP agreement (S1) are shown in Table 6.

Table 4. Difference Assumption S1 and S2

No	Description	S1	S2
1	Investment Cost (Rp billion)	12.832,456	
2.	Initial Toll Fare (Rp)	75.000	56.000 (decrease 25,3%)
3	Operation and Maintenance Cost (Rp million)	84.000	88,864 (increase 5,79%)
4	Daily Traffic (vehicles/day)	24.489	27.587 (increase 12,65%)
5.	Concession Period	50 years	

Source: www.jasamarga.com (2022), Processed

The first step is to calculate the investment cost based on the data obtained. Then the investment costs are divided into funds used, 70% using debt and 30% using equity.

The second step is to perform calculations on toll revenues. Toll revenues are calculated by considering the volume of traffic, tariffs, adjusting tariffs period, traffic growth and the concession period. The investment cost and concession period would be the same compared to S1 and S2. Toll Fare growth refers to average inflation over the last 10 years, so toll fare growth is 8% per 2 years. Based on the interviews results, operating and maintenance costs was approximately increase between 3% and 5% (P4, P5).

For S2, toll fare based on WTP or IDR 747/km. Meanwhile, based on the the interview results (P1), it was found that every 30% change in tariffs causes a 15% change in traffic volume. The relationship between tariff changes and changes in traffic volume is inversely proportional, meaning that every 2% increase in tariffs causes a 1% decrease in traffic volume. Due to the reduction in toll fare reduce IRR, Existing Toll Road fare increase. Based on interviews results (P6), it was found that every change in toll fare of IDR 500 causes a change in traffic volume of 2.37%. The relationship between tariff changes and changes in traffic volume is inversely proportional, meaning that every Rp. 500 tariff increase causes a 2.37% decrease in traffic volume. So Existing Toll Road less sensitivity due to the higher ability to pay, limited alternative roads (P1, P5).

The third step is to perform calculations on operating and maintenance costs (OM costs). OM costs are calculated based on cash and non-cash costs. Cash costs are calculated based on interview results, while non-cash costs are calculated by calculating amortization and depreciation. Then the total cash and non-cash costs compared with the OM costs contained in the Annual report Jasa Marga. Furthermore, cash costs increase 5% per year. This by considering inflation, increase in the Minimum Wage and the increase in land taxes (P4, P5).

The fourth step is to calculate profit and loss, balance sheet and cash flow. Calculations are carried out on S1 first to determine the magnitude of the IRR value of the project on the toll road concession which is the case study. Furthermore, the S2 calculation is carried out by adjusting tariffs, traffic volume, operating and maintenance costs and interest rates. After these adjustments were made, the IRR of the project decreased due to reduced cash inflow. For this reason, an additional tariff calculation is carried out on the Existing Toll Road which results in the same project IRR as S1.

A sensitivity analysis of the main parameters will be carried out to determine the sensitivity of these parameters to the IRR of the project. Based on the calculation results, the results of the sensitivity analysis are as shown in the table 7.

Table 5. Sensitivity Analysis

No	Description	Value	Value (IRR project=WACC)	Deviation
1	Investment Cost (IDR billion)	12.832.456	16.492.081	29%
2	Traffic (million vehicle/years)	1.478	1.187	-20%
3	Initial Toll Fare (IDR/km)	1.000	698	-30%
3	Tariff Growth	8,00%	4,75%	-41%
4	Interest Rate	10,39%	13%	26%

Based on the results, the most sensitive parameter to the IRR project is traffic volume. Because traffic volume reflects the toll revenue. Toll revenue is a key factor because the characteristics of the toll road business have a high EBITDA margin of up to 80% so that revenue achievement affects 80% of cash flow. Toll Fare and Toll Fare growth less sensitivity because the increase in these parameters does not also increase revenue, referring to the willingness and ability of toll road users.

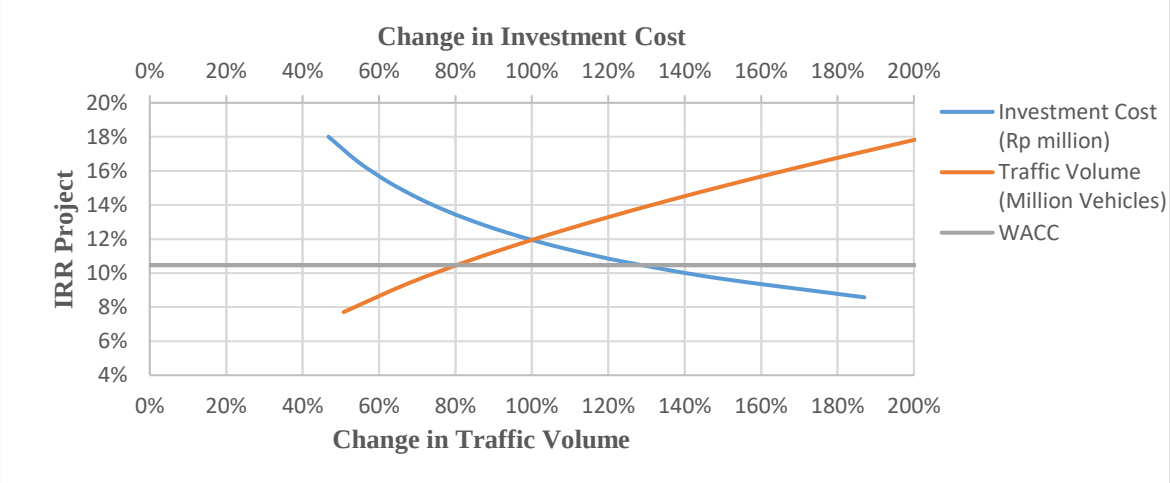

Figure 1. Sensitivity Analysis

Based on the calculation results and Figure 1, it is found that when the traffic volume at the beginning below target, the IRR of the project will decrease, and when the decrease reaches 20%, the IRR of the New Toll Road project will be equivalent to the WACC. If there is an increase in investment costs of 29%, the IRR of the New Toll Road project will be equivalent to the WACC. So the NPV of the New Toll Road will be equal to zero.

Based on the calculation results and Figure 2 below, it is found that an increase in inflation or a toll fare growth will increase the IRR project, so that when there is a decrease in inflation it will reduce the IRR project and if the inflation rate becomes 2.375% per year so that the rate adjustment per 2 years is 4 .75% then the IRR of the New Toll Road project will be equivalent to the WACC. Meanwhile, the amount of the initial tariff will be directly proportional to the IRR project. However, in a certain value, increasing the rate can cause a decrease in the project's IRR. Because toll fare affected traffic volume based on the willingness and ability to pay. Based on the calculation results, if the initial tariff is IDR 689/km, then the New Toll Road will be equivalent to the WACC value.

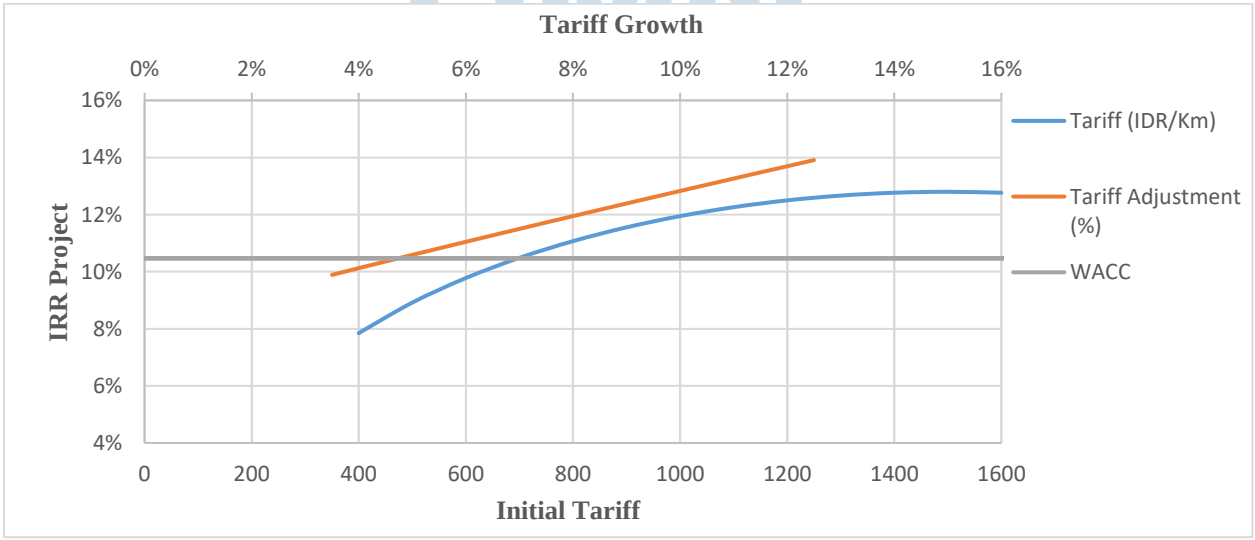

Figure 2. Sensitivity Analysis 2

Investment costs are one of the most sensitive parameters because the investment costs in toll road project are very huge and spent at the initial concession period. Meanwhile, interest rates are also a sensitive parameter finance from debt. So that interest rates will be affected interest expenses and WACC.

Furthermore, a scenario analysis is carried out if the concession of the New Toll Road is carried out with a new PPP agreement (S1) or if the New Toll Road is added to the scope of the existing PPP agreement (S2). Based on the calculation results obtained a comparison of the net present value (NPV), payback period (PBP), cash deficiency support (CDS).

Table 6. Financial Impact in S1 and S2 scenario

No.	Code	Financial Impact		
		NPV (Rp million)	CDS (Rp million)	PBP (year)
1	S1	3.595.478	2.880.496	18,58
2	S2	7.018.975	1.029.565	17,78

It was found that S2 had better performance, where the NPV value was higher, CDS was lower, and PBP was faster. This is due to S2 having a larger cash inflow at the initial support by extra revenue from Existing Toll Road as shown by PBP which is faster in S2. In addition, this can also reduce CDS from IDR 2.88 trillion to IDR 1.029 trillion. The CDS value is to pay principal installment payments, considering that seventy percent of toll road financing is done with debt. Generally, CDS can be financed with a junior loan or equity from shareholders. When use a junior loan, generally the new principal payment can be made after the senior load has been paid so that it will increase the interest expense.

The larger initial cash inflow does not significantly affect the NPV. The main factor causing the large difference in NPV is the difference in interest rates from S1 and S2. Under scenario S1, the New Toll Road concession is carried out by a company that has just been established so that it will receive a higher l interest rate than if it was carried out under scenario S2. Meanwhile, in the S2 scenario, where toll road concessions are carried out by companies that have been around for a long time and have ongoing toll road concessions, they will get cheaper loan interest rates and have other funding alternatives such as bonds, sukuk, or by securitizing toll road revenues. With lower interest rates, besides optimizing interest expenses, it will also reduce the WACC so that the NPV value will improve.

Table 7. Existing Toll Road Adjustment

No.	Code	Toll Fare			Toll Revenue		
		Initial (Rp)	Additional (Rp)	Additional (%)	New Toll Road	Existing Toll Road	Total
1	S1	8.000	0	0%	670.382	0	670.382
2	S2	8.000	2.579	32,2%	564.123	276.248	840.371

An additional toll fare of Rp. 2,579 is required to compensate for the reduced toll fare on the New Toll Road. Hence, the Existing Toll Road increase of 40.2%, which 8% is a regular toll rate increase and 30.2% is a special adjustment to support New Toll Road.

Table 8. Weighted Average Cost of Capital

Description		S1	S2	Refference and source
Risk Free Return	Rf	7,11%	7,11%	Indonesia Government Bond, IBPA January 13th 2023 Source : www.phei.co.id (2023)
Equity Beta (proxy)	β	0,96	0,96	Calculation
Country Equity Risk Premium	CERP	9,23%	9,23%	Damodaran, Jan 2023 Source : www.nyu.edu (2023)
Equity Risk Premium	ERP	8,87%	8,87%	β * CERP
Cost of Equity	**(Ke)**	**15,98%**	**15,98%**	**Rf + ERP**
Lending Interest Rate	Kd	10,39%	8,23%	S1 : Corporate Bond with A rating S2 : Corporate Bond with AA rating Source : www.phei.co.id (2023)
Effective Tax Rate	t	22%	22%	Corporate tax
Cost of debt	**(Kd) x (1-t)**	**8,10%**	**6,42%**	**(Kd) x (1-t)**
Equity Portion	e%	30%	30%	Equity portion
Debt Portion	d%	70%	70%	Debt portion
	WACC	**10,47%**	**9,29%**	**(Ke x e%) + (Kd x (1-t) * d%)**

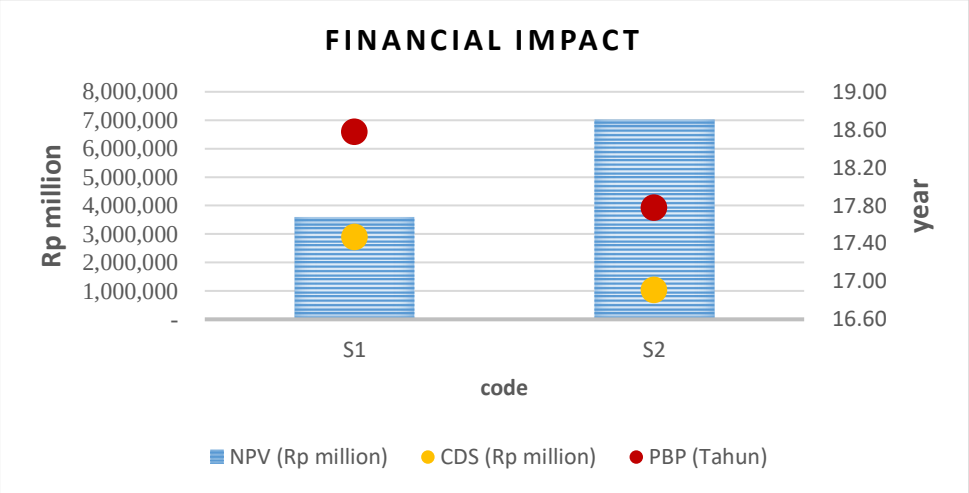

Figure 3. Financial Impact in S1 and S2 Scenario

Based on the calculation, it is found that S2 has better performance, where the NPV value is higher, CDS is lower and PBP is faster.

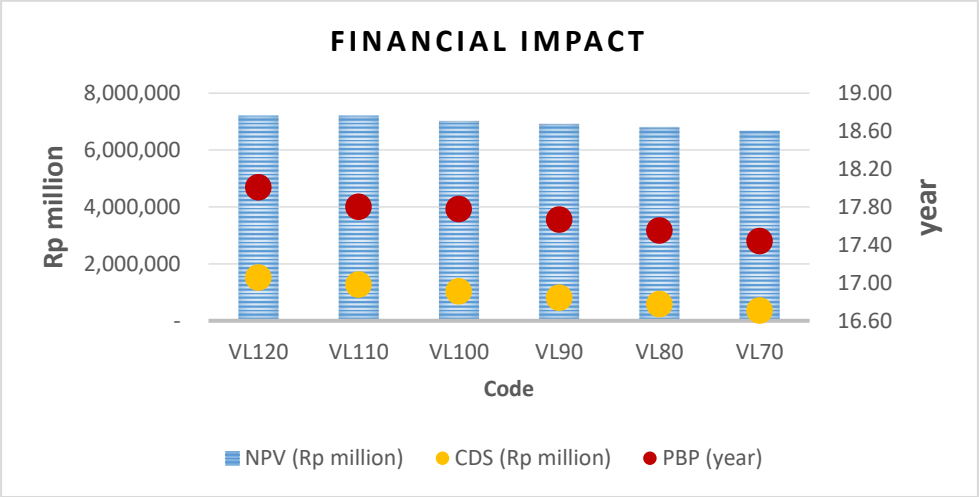

Figure 4. Financial Impact in Difference Traffic Volume

Based on the sensitivity analysis, it was found that traffic volume is the most sensitive variable. This scenario analysis was conducted to find out how traffic volume on the Existing Toll Road affects the NPV, CDS and PBP of the New Toll Road. From the picture above VLL100 is the Existing Toll Road with traffic volume like the Jakarta-Tangerang Toll Road, while VLL 110 describes the Existing Toll Road with a volume of 10% higher than the Jakarta-Tangerang Toll Road, while VLL90 describes the Existing Toll Road with a volume of 10% higher than the Jakarta-Tangerang Toll Road and so on. Based on the analysis, it was found that if the New Toll Road tariff is added to the Existing Toll Road which is getting busier or the traffic volume is greater, the NPV will increase. This is possible because the New Toll Road received a larger cash inflow at the beginning of the period indicated by a faster PBP. What's interesting here is that if the fare is deposited on toll roads which are quieter or have a smaller traffic volume, then the CDS value will be smaller. This is possible because to achieve the feasibility of certain projects, the quieter Existing Toll Roads will require higher tariffs and because the ratio of tariff sensitivity to traffic volume is less than one. So that the increase in cash flow on the quieter Existing Toll Roads can keep up with cash needs to make principal repayments of debt.

Furthermore, a scenario analysis is carried out on the investment costs incurred on the New Toll Road. This scenario analysis was conducted to find out how the length of the New Toll Road, which correlates with the investment cost of the New Toll Road, affects the NPV, CDS and PBP of the New Toll Road. From the image below, P100 is when the New Toll Road has a length of 75 km and an investment cost of IDR 12.8 trillion, such as the Semarang-Batang Toll Road. Whereas P150 describes the New Toll Road which will be expanded in scope as having a length of 112.5 km or 1.5 times longer than the Semarang-Batang Toll Road and with investment costs also 1.5 times greater than the Semarang Batang Toll Road and so on. Based on the analysis, it is found that the longer the new toll road that will be added, the better the NPV and PBP, but the longer the new toll road that must be built requires a greater CDS.

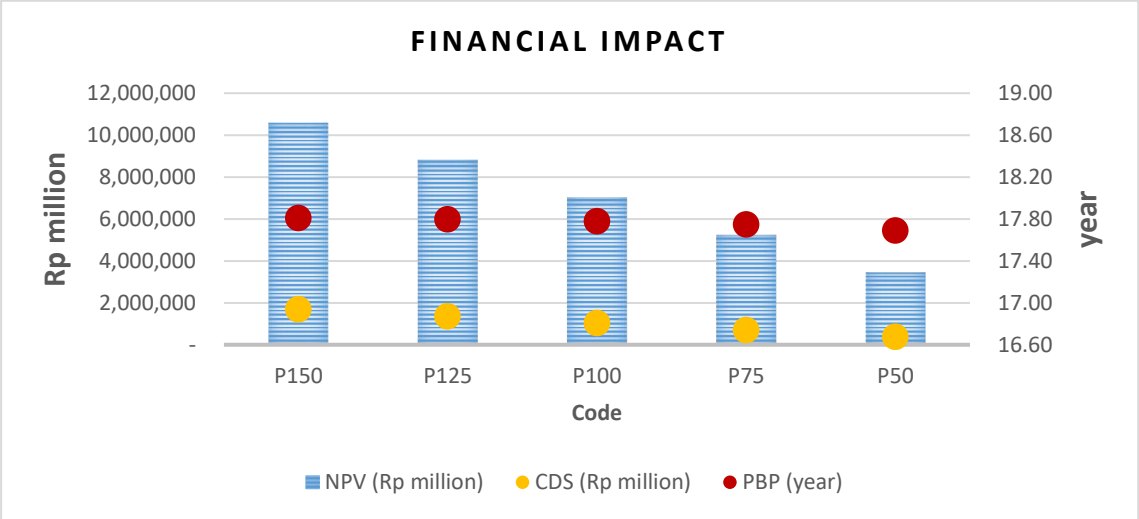

Figure 5. Financial Impact in Difference Investment Cost

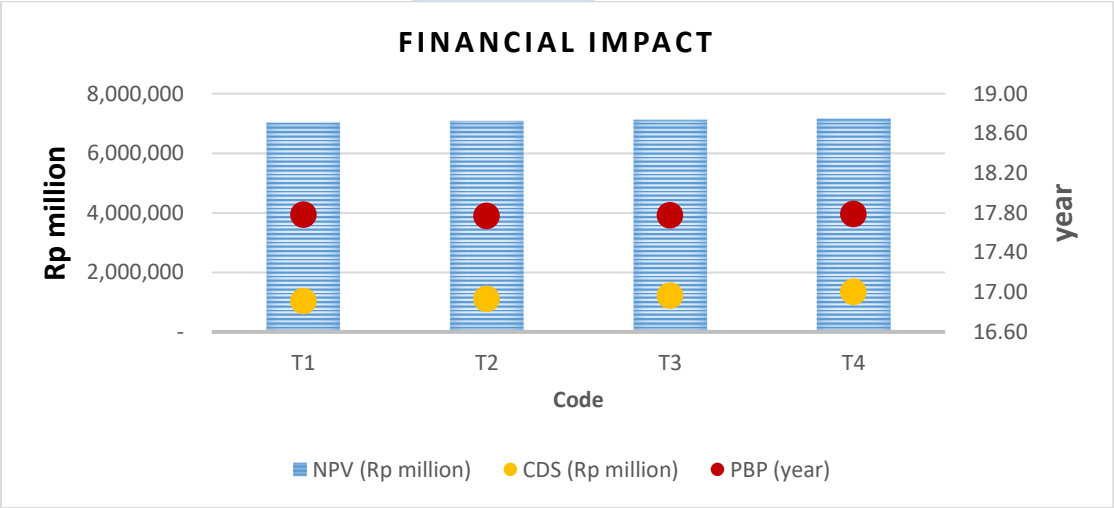

Figure 6. Financial Impact in Difference Toll Fare Adjustment

To minimize the impact on traffic volume, revenue and social impact in higher toll fare adjustment, a scenario analysis is then carried out on the how many stages of tariff adjustments entrusted to the Existing Toll Road. This analysis is carried out if the tariff adjustment is made only once (T1), or 2 times with the same amount of increase (T2), or 3 times with the same amount of increase (T3), or 4 times with the same amount of increase (T4).

Based on the results of the analysis, it was found that the NPV and PBP values were not too affected by the intended tariff adjustment phases. However, the more phasing is carried out, the CDS will increase. This occurs because the cash flow that comes in at the beginning will be greater if the rate adjustment is only made once. However, the larger cash inflows at the beginning cannot be shown in the PBP analysis because the tariff adjustment is carried out in 4 stages or in a maximum of 8 years, while PBP is around 17 years, so that cash flows after the 8th year will tend to be the same for all stages of tariff adjustment.

In addition to analyzing the NPV, CDS and PBP, this study also calculates the amount of fare increases that must be made on the Existing Toll Road to compensate for the reduced fares on the New Toll Road. This is important because adjust toll fare affected traffic volume,

maintenance costs and toll revenues and have social impact of toll road users. If there is a tariff adjustment that is large enough, it will increase the resistance from the public and the government's refusal to implement it.

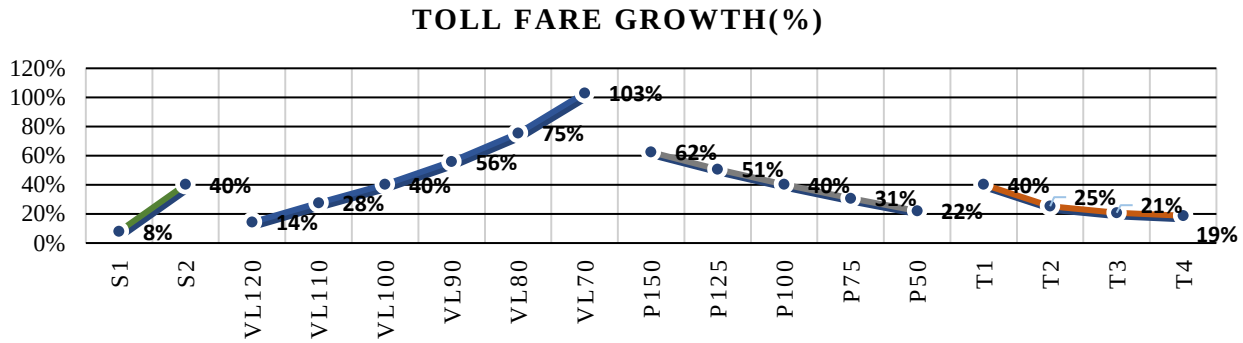

Figure 7. Toll Fare Adjustment

Based on Figure 7, the smaller the traffic volume on the New Toll Road, to maintain the same level of IRR required higher additional fare on the Existing Toll Road and increase exponentially. This is due to the value of the sensitivity ratio below 1, meaning that traffic volume is not sensitive to tariff adjustments. Furthermore, the greater the investment cost of the New Toll Road required higher additional fare on the Existing Toll Road and increase exponentially.

To anticipate the social impact, traffic volume and revenue, toll fare adjustments can be made in stages. Based on the results of the analysis, adjusting in 4 stages can reduce the increase in tariffs by more than 50% from 40% with 1 time adjustment to 19% with 4-time adjustments.

Table 11. Toll Fare in Indonesia

No.	Toll Road Segment	Length (Km)	Toll Fare (Rp)	Toll Fare (Rp/Km)	Operation Date
1	Jakarta-Bogor-Ciawi (Jagorawi)	59,0	7.000	119	1978
2	Jakarta-Tangerang (Janger)	33,0	5.500	167	1984
3	Prof. Dr. Ir. Sedyatmo (Sedyatmo)	14,3	8.000	559	1984
4	Cawang-Tomang-Pluit (JIUT)	23,6	10.500	445	1987
5	Jakarta-Cikampek (Japek)	83,0	20.000	241	1988
6	Padalarang-Cileunyi (Padaleunyi)	64,4	10.000	155	1990
7	Cikampek-Padalarang (Cipularang)	58,5	42.500	726	2003
8	Palimanan-Kanci (Palikanci)	26,3	12.500	475	1998
9	Semarang A,B,C (Semarang ABC)	24,8	5.500	222	1983
10	Surabaya-Gempol (Surgem)	46,6	23.000	494	1986
11	Belawan-Medan-Tanjung Morawa (Belmera)	42,7	8.500	199	1986
12	Jakarta Outer Ring Road (JORR)	66,0	16.000	242	1991
13	Ulujami- Pondok Aren	5,6	3.000	536	2001
14	Tangerang-Merak (Tamer)	72,5	53.500	738	1990
18	Waru-Juanda	12,8	8500	664	2008
20	Ujung Pandang	10,4	10000	962	1998

Source: www.jasamarga.com and www.bpjt.pu.go.id

Based on the literature review, it was discovered that certain toll roads in Indonesia, including Jagorawi, Janger, JIUT, Padaleunyi, Japek, Palikanci, Semarang ABC, Belmera, and JORR, have tariffs below Rp 500/km. These toll roads are in major cities such as Jakarta, Bogor, Tangerang, Bekasi, Surabaya, Bandung, Medan, Makasar, and Cirebon, which have higher per capita incomes compared to other cities in Indonesia. The higher per capita income indicates a greater willingness to pay for toll road usage. This is evident from recently opened toll road sections like Cinere-Serpong, Serpong-Kunciran, and Kunciran-Cengkareng, which have tariffs exceeding Rp 1,500/km (PT Jasa Marga (Persero) Tbk, 2022). Therefore, there is potential to increase toll fares in these toll road sections to generate additional funds for the development of new toll roads. However, it is important to acknowledge that increasing toll fares can impact traffic volume, and a rate increase does not necessarily guarantee higher toll revenues. To address these concerns, it is crucial to assess the ability of toll road users to pay and evaluate the sensitivity of tariffs to traffic volume. Additionally, the social impact on toll road users and the political implication of significant tariff increases for the government should be carefully considered. To optimize this approach, the selection of existing and new toll roads should involve an evaluation of investment costs, traffic volume, tariffs, and other key parameters. Furthermore, implementing a phased toll rate increase can help mitigate the potential negative impacts of such adjustments.

4. CONCLUSION

Expanding the scope of existing toll road PPPs agreements to development new toll road projects have demonstrated improved financial feasibility. These projects benefit from higher initial cash inflows due to the additional revenue generated by the existing toll roads. It is results higher Net Present Value (NPV), lower Credit Default Swap (CDS), and faster Payback Period (PBP) compared to with new PPP arrangements. The reduced CDS enables investors to have greater flexibility in expanding their toll road portfolios, thereby aiding the Indonesian government in achieving its toll road development objectives.

The variance in loan interest rates is a key factor contributing to the substantial disparity in NPV. The expanded scope of the existing toll road sections makes alternative funding options beyond bank loans, such as bonds, sukuk, or securitization of revenue from the existing toll roads. These alternative financing avenues not only offer lower interest rates but also allow for the structuring of principal payments according to the project's cash flow capacity, resulting in increased NPV.

Sensitivity analysis of the primary parameters influencing the Internal Rate of Return (IRR) for toll road development projects in Indonesia reveals that traffic volume, loan interest rate, investment cost, tariff, and inflation are the most sensitive factors. Traffic volume emerges as the most influential parameter. The impact traffic volume on the NPV, CDS, and PBP of the new toll roads indicates that increasing the tariff on the existing toll roads with higher traffic volume leads to an increase in NPV for the new toll roads, as the new toll roads get greater cash inflows during the initial period, resulting in a faster PBP. However, adding the tariff for the new toll roads to the existing toll roads with higher traffic volume results in an increase in the CDS value because, to achieve a certain project feasibility level, the less congested existing toll roads require higher tariffs due to the sensitivity ratio of tariff to traffic volume being less than one. Consequently, augmenting the cash flow on the less congested existing toll roads can meet the cash requirements for repaying the principal debt.

Additionally, an examination of the relationship between the length of the new toll roads that associated with investment costs reveals that bigger new toll roads result limited influence on NPV and PBP. However, bigger new toll roads necessitate larger CDS values. This analysis

used to selection of existing toll roads in the plan to expand the scope of new toll road development.

The development of new toll roads with an expanded scope on existing toll road PPPs often involves increasing tariffs on the existing toll roads and/or their concessions periods to support the development of new toll roads. These tariff adjustments have social implications for toll road users. To mitigate the social impact on toll road users, traffic volume and revenue of the existing toll roads, tariff adjustments can be implemented gradually. However, implementing phased tariffs has limited effect on the NPV and PBP. Although reducing the number of tariff adjustment phases can increase cash flow during the initial period, this effect is not significantly reflected in the PBP analysis results. This is primarily because the maximum tariff adjustment occurs over four phases or eight years, while the PBP extends over more than seventeen years, resulting in similar accumulations cash flow after the eighth year for all tariff adjustment phases. Nevertheless, increasing the number of tariff adjustment phases will elevate the CDS value since higher cash inflows can be achieved with a single tariff adjustment.

Expanding the scope of existing toll road PPPs agreements to development new toll road projects has proven to be financially viable. These projects benefit from higher initial cash inflows resulting from the additional revenue generated by the existing toll roads. As a result, they exhibit improved Net Present Value (NPV), lower Cash Deficiency Support (CDS), and faster Payback Period (PBP) compared to projects under new PPP agreements. The reduced CDS provides investors with more flexibility to expand their toll road portfolios, supporting the Indonesian government's toll road development goals.

The disparity in NPV is primarily attributed to variations in loan interest rates. By expanding the scope of existing toll road sections, alternative funding options such as bonds, sukuk, or securitization of revenue from the existing toll roads become available. These alternatives not only offer lower interest rates but also allow for principal payments to be structured according to the project's cash flow capacity, resulting in increased NPV.

Sensitivity analysis of key parameters influencing the Internal Rate of Return (IRR) for toll road development projects in Indonesia highlights traffic volume, loan interest rate, investment cost, tariff, and inflation as the most sensitive factors. Among these, traffic volume has the greatest impact. Analyzing the impact of traffic volume on NPV, CDS, and PBP reveals that increasing tariffs on the existing toll roads with higher traffic volume leads to an increased NPV for the new toll roads, as they receive greater cash inflows during the initial period, resulting in a faster PBP. However, adding tariffs for the new toll roads to the existing ones with higher traffic volume raises the CDS value. This occurs because the less traffic volume existing toll roads require higher tariffs to achieve a certain project feasibility level. When the sensitivity ratio of tariff to traffic volume is less than one, increasing cash flow on the less traffic volume on existing toll roads can meet the cash requirements for repaying the principal debt.

Furthermore, analyzing the relationship between the length of the new toll roads (higher investment costs) reveals that larger new toll roads have limited influence on NPV and PBP. However, larger toll roads require larger CDS values. This analysis aids in the selection of existing toll roads when expanding the scope of new toll road development.

Expanding the scope of existing toll road PPPs agreements to development new toll road projects often involves increasing tariffs on the existing toll roads and/or their concessions periods. These tariff adjustments have social implications for toll road users, as well as effects on traffic volume and revenue of the existing toll roads. To mitigate the social impact, tariff adjustments can be implemented gradually. However, the gradual adjustment of tariffs has limited influence on NPV and PBP. While reducing the number of tariff adjustment phases can

increase cash flow during the initial period, this effect is not significantly reflected in the PBP analysis results. This is primarily because the maximum tariff adjustment occurs over four phases or eight years, while the PBP extends over more than seventeen years, resulting in similar cash flow accumulations after the eighth year for all tariff adjustment phases. Nevertheless, increasing the number of tariff adjustment phases will raise the CDS value since higher cash inflows can be achieved with a single tariff adjustment.

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