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## INVESTMENT RISK OF SOLO-NGAWI TOLL ROAD

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### Abstract

In investing, there is definitely a risk, as well as the concession of toll roads. Risk analysis is used to anticipate losses due to an element of risk at each investment stage. The results of the analysis show that the highest risk probability for the Solo-Ngawi toll road is land availability and the influence of weather during development and the highest risk impacts are land availability, the potential for revolution in state governance. Based on the results of the analysis, the investment risk level of the Ngawi Solo Toll Road is included in the moderate risk category, so there is a need for cooperation in risk assurance by the Insurance Agency so that the risk level can be reduced to be lower than before.

*Keywords:* risk analysis, toll road, investment

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### INTRODUCTION

Cooperation between the government and Toll Road Business Entities (BUJT) in the form of toll road concessions certainly carries risks. Investor confidence in this case will also be affected by the uncertainty of a risk. Karsaman in journal *Perencanaan Wilayah dan Kota* 2007 [1], explains that in order to anticipate losses that may arise, the risks in toll road investment must be known and evaluated by analyzing the risks that will occur. Base on this background, the exploitation risk analysis carried out in this study is based on the experience of Stake Holders in exploitation and is outlined in a questionnaire related to the amount of risk in the total value of toll road concessions, operations revenues on the Solo-Ngawi Toll Road.

The purpose of this research is to analyze risk allocation based on the probability and risk impact of the exploitation of the Solo-Ngawi Toll Road based on Pd T-01-2005-B [2].

### Investment of Toll Road

The implementation of toll roads in Indonesia has been regulated in the PUPR Minister Regulation number 06 / PRT / M / 2018 [3], where the Indonesian Government as the owner and authority to administer toll roads can delegate the construction, operation and maintenance of toll roads to BUMN or the private sector, as well as deferred land acquisition costs to the government as the owner of the land.

Toll road concession based on PUPR Minister Regulation No. 01/PRT/M/2017 [4], in the sense of the cooperation activities between the Government and Business Entities that includes financing, technical planning, construction, operation and / or maintenance of

toll roads. Planning for the construction of these toll roads can be carried out at the initiation of the government, both central and regional or can also be initiated by business entities that propose the construction of the toll roads [5].

### Solo-Mantingan-Ngawi Toll Road

Based on the 2010 planning document, the government cooperates with Jasa Marga and Waskita Toll Road as a Business Entity to carry out the construction of the Solo-Kertosono toll road which is divided into two sections, namely Solo-Ngawi Ngawi Kertosono. The cooperation aims to ensure the financial feasibility of the toll road construction [6] with a total funding value of IDR 11.341 billion which is divided into several aspects, with the following details:

Table 1 Investment Cost of Solo-Ngawi Toll Road (in IDR. Million)

Uraian	Business Plan Review in 2017 (in Million)
a. Construction Costs	IDR 7.294.147.000
b. Toll Equipment	IDR 91.946
c. Design	IDR 167.091
d. Supervision	IDR 263.527
e. Land Acquisition Cost	IDR -
f. Escalation	IDR 899.816
g. VAT 10%	IDR 925.803
h. Overhead Cost	IDR 541.501
i. IDC	IDR 941.725
j. Financial Cost	IDR 216.297
<b>Total Investment Costs</b>	<b>IDR 11,341,853,000</b>

Source: Minutes of Change of Solo-Ngawi Toll Road Concession Business Plan, 2017 [7]

### Risks of Toll Road Development

Toll road investment risks are divided into 3 groups, namely the Pre-Construction Stage (tender process, risk management in contract documents, data and assumptions on studies, design and land acquisition), Construction Stage (project financing / funding, construction construction, equipment and force majeure at the construction stage) as well as the Post-Construction Stage (operation and maintenance, toll revenues, fulfillment of refund obligations (exchange rates and interest rates) and force majeure at the post-construction stage).

### RESEARCH METHOD

The research method is the scientific method used in the execution of research, flow charts and formulas for solving the problems. In writing research methods can also be broken down into several sub-chapters as below:

#### A. Risk Analysis

To calculate the risk factor in the analysis of the level of risk based on Pd T-01-2005-B, use the following equation:

$$FR = L + I - (L \times I) \quad (1)$$

Where :

- FR = Risk Factor (on a scale of 0-1)
- L = The probability of the risk event
- I = The magnitude of the risk impact (in terms of percentage increase in cost)

After counting the FR, it can be categorized their risk levels by the table below:

Table 2 Risk Category

Risk Factor Value	Category
> 0,7	High Risk
0,4 – 0,7	Medium Risk
< 0,4	Low Risk

(Source : Pd T-01-2005-B [2])

If depicted in the diagram, the relationship between the risk probability and the magnitude of the risk impact is as follows:

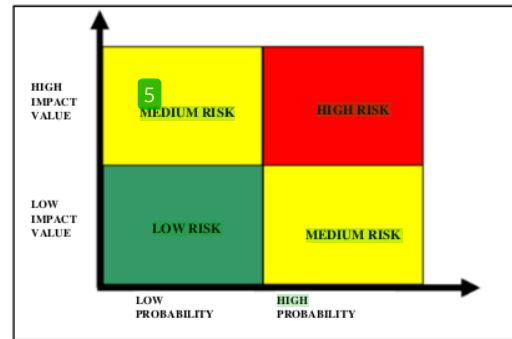


Figure 1 Risk Category Matrix  
(Source : Pd T-01-2005-B [2])

#### B. Methodology

There are three stages in this research, namely the Preparation Stage, the Data Collection Stage and the Data Processing Stage. In the preparatory stage, the researcher identifies the problem and formulates the objectives and limits of the study. After that, enter the data collection stage, where the data is divided into 2 types, namely primary data, namely related to risk allocation, probability magnitude and risk impact (data obtained through interviews using questionnaires to stakeholders (Policy Determinants / Regulators / Toll Road Business Entities) / Expert) in the field of toll road concession risk management) while the second is secondary data related to investment costs, operational and maintenance costs in 2018, as well as plans for toll receipts from traffic in 2018 (The data is obtained from data on the business plan for the Solo-Ngawi toll road project). The probability level and impact level questionnaires were prepared by means of scoring assessments based on the Project Management Body of Knowledge book [8].

Then at the data processing stage, the results of the questionnaire as primary data for the probability value use the 90th percentile value and the average impact value is taken from the total respondents. For the validity of probability and impact values were tested using the Spearman correlation and reliability was tested using Kendall's Tau concordance [9].

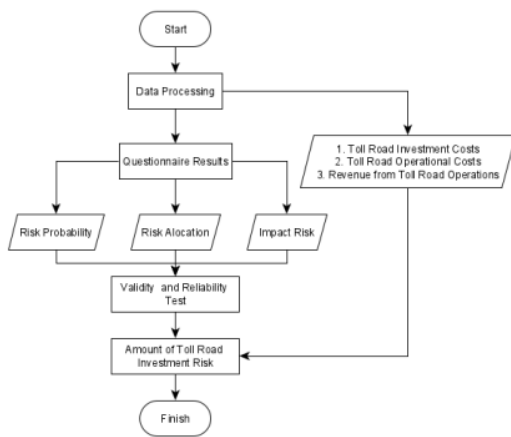


Figure 2 Data Processing Flowchart  
(Source : Research Result)

## RESULT AND DISCUSSION

### A. Allocation of Risk

The majority of respondents thought that at the pre-construction stage, the licensing risk group (A) was borne by the Government as the party that organizes and is responsible for the procurement of toll road concessions. For the pre-construction study risk group (B), the sharing of risk allocation is carried out between the Government and BUJT, with the Government 50-60% and BUJT 40-50% for the risk of "feasibility study. Data accuracy (B1)", and 50%: 50% for the Government and BUJT with the risk of "forecasting the accuracy of economic growth and traffic (B2)". The risk group in the draft toll road allocation plan (C) is borne by the BUJT which is considered more competent and skilled in toll road construction, while the risk group for land acquisition (D) is borne by the government as a whole, it also refers to the Minister PUPR Republic of Indonesia No. 18 / PRT / M / 2016 Concerning Determination and Procedures for Use of Bailout Enterprises for Toll Road Land Acquisition [10].

Table 3 Pre-Construction Risk Allocation Questionnaire Results

No	Risk Group	Stakeholders		
		Government	Business Entity	Share
A	Licensing			
ii	Openness of the tender process	V		
i.ii	Arrangements regarding risk in contracts	V		
B	Studies			
ii.i	The accuracy of the feasibility study data			V
ii.ii	The accuracy of economic and traffic growth estimates			V
C	Design			
ii.i	Consistency of planning standards		V	
ii.ii	Misinterpretation of the consultant with the assignor		V	
D	Land acquisition			
iv.i	Land availability	V		
iv.ii	The compensation process and the compensation price	V		
iv.iii	Community / environmental situation	V		
iv.iv	Monopoly / land broker	V		

(Source : Questionnaire Results)

At the construction stage, the majority of respondents thought that the risk allocation was borne by the BUJT, except for the Force majeure risk group that occurred during the construction period. For risks related to project locations in areas prone to natural disasters (D1), risk sharing is carried out between the Government and the BUJT with risk sharing where the Government is 40-50% and the BUJT is 50-60%, whereas in the event of a force majeure related to politics in government the allocation of risk is borne by the government.

Table 4 Results of the Construction Risk Allocation Questionnaire

No	Risk Group	Stakeholders		
		Government	Badan Usaha	Share
A	Financing and Funding			
ii	Consistency in the continuity of sources of funds		V	
i.ii	Consistency of loan interest rates		V	
ii.iii	Availability of bonds / bonds		V	
ii.v	Short term loan payments		V	
B	Construction			
ii.i	Unexpected field conditions		V	
ii.ii	Weather influence		V	
ii.iii	Availability of materials		V	
ii.iv	Logistics / material location security		V	
ii.v	Quality of execution / work results		V	
ii.vi	Project implementation management		V	
ii.vii	Project worker conditions and situations		V	
ii.viii	Preparation of a schedule for the implementation of the work		V	
ii.ix	The accuracy of construction cost estimates		V	
ii.x	Inflation against material prices		V	
ii.xi	Honesty of workers or executors		V	
C	Equipment			
iii.i	Procurement of construction equipment		V	
iii.ii	Construction equipment performance		V	
D	Force Majeure			
iv.i	The project location is prone to natural disasters			V
iv.ii	Demands for project nationalization	V		
iv.iii	The potential for revolution in state governance	V		

(Source : Questionnaire Results)

In the post-construction stage, respondents stated that the dominant risk allocation was borne by the BUJT, except for the risk of Force majeure. In the toll revenue risk group (B), namely risks related to initial tariffs / tariff adjustments (B4) and risks related to political intervention (B4), the risk allocation is borne by the government. For the Force Majeure (D) risk group, risk allocation is related to the project location (D1) and if there is a demand for nationalization (D2) on the project, it is borne by the BUJT and the government with a 50%: 50% share, while for risk allocation if there is potential governmental revolution (D3) is fully borne by the government.

Table 5 Post-Construction Risk Allocation Questionnaire Results

No	Risk Group	Stakeholders		
		Government	Business Entity	Share
A	Operation and Maintenance			
ii	The effectiveness of operational and maintenance systems		V	
i.ii	Results / products of toll road construction		V	
ii.iii	The accuracy of the estimated operating and maintenance costs		V	
ii.v	Inflation in operating and maintenance costs		V	
i.v	Destruction of buildings / Vandalism		V	
i.vi	Traffic accident rate		V	
i.vii	Public order and security conditions		V	
B	Toll Revenue			
ii.i	The accuracy of traffic volume estimates		V	
ii.ii	Disclosure of initial rates / tariff adjustments	V		
ii.iii	Competition routes / modes of transportation		V	
ii.iv	Level of political intervention	V		
C	Obligations			
iii.i	Currency exchange rate consistency		V	
iii.ii	The consistency of loan interest rates		V	
D	Force Majeure			
iv.i	The project location is prone to natural disasters			V
iv.ii	Demands for project nationalization			V
iv.iii	The potential for revolution in state governance	V		

(Source : Questionnaire Results)

### B. Probability and Impact of Risk

The probability value of the risk sub-group is obtained from the 90th percentile value (of all respondents), while for the probability of the risk group it is the average result of the risk sub-group. The following is the value of the toll road investment risk probability:

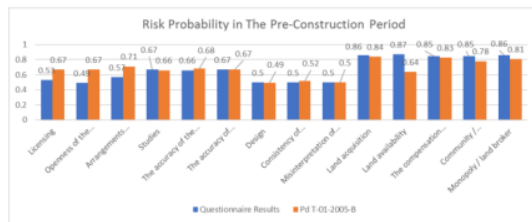


Figure 3 Risk Probability in The Pre-Construction Period (Source : Research Result)

In Figure 3, all respondents' answers regarding the probability at the pre-construction stage are higher than the technical guidelines (Pd T-01-2005-B), with the highest probability, namely the risk of land availability, due to the adjacent land acquisition period and development instructions, so that during the construction stage there is still land that is not yet free and / or still in the negotiation process.

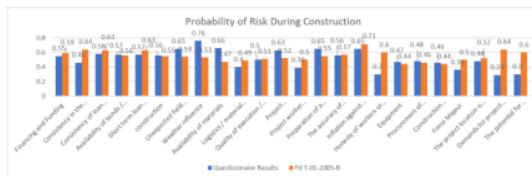


Figure 4 Probability of Risk During Construction (Source : Research Result)

In Figure 4, the financing risk group and Force Majeur risk, the results of the questionnaire are lower than the guideline, because the level of confidence of respondents is higher in funding from PT. Jasamarga Solo Ngawi and Solo City have never had a history of cities with a status prone to natural disasters. Meanwhile, in the development risk group, the results of the questionnaire were higher than the guidelines because the Solo-Ngawi Toll Road was the first toll road in Solo City and the highest risk probability occurred in the risk of weather influence during construction.

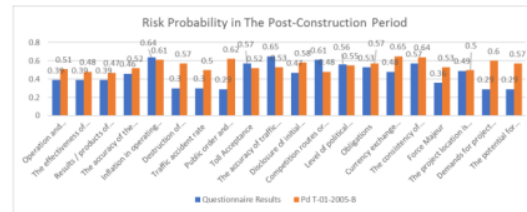


Figure 5 Risk Probability in The Post-Construction Period (Source : Research Result)

In Figure 5, the majority of all risk groups are at the post-construction stage, the results of the answers from respondents are lower than the guidelines, assuming the respondents are PT. Jasamarga Solo Ngawi (JSN) is considered experienced in toll road operation. The highest risk probability according to the respondent is the level of accuracy of the estimated traffic volume, this is because non-toll roads are considered to be more profitable than the Solo-Ngawi toll road.

Unlike the probability, to get the value of the risk impact, the calculation uses the Mean - Standard Deviation approach. The following is the value of the impact of toll road investment risks:

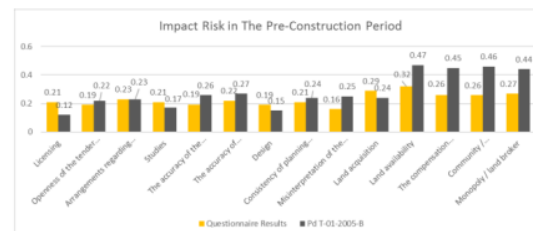


Figure 6 Impact Risk in The Pre-Construction Period (Source : Research Result)

In Figure 6 as a whole, the results of the answers from respondents are lower than the guideline with the highest risk impact according to respondents, namely the risk of land availability. Delays in the construction process due to the availability of land will hamper the operation of a toll.



Figure 7 Impact Risk During Construction Period (Source : Research Result)



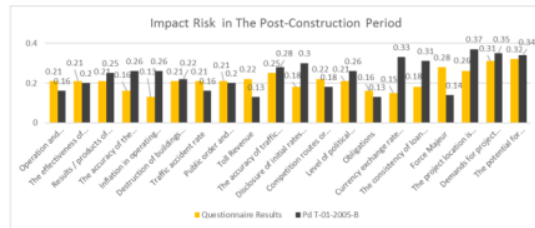


Figure 8 Impact Risk in The Post-Construction Period (Source : Research Result)

Based on Figure 7 and 8 as a whole, the results of the respondents' answers are lower than the guidelines. This is because the respondents trust PT. JSN has strong funding, has more experience in the construction and operation of toll roads so that it can reduce the impact of risks. The highest risk impact by respondents occurred in sub-groups of potential revolution due to political turmoil, which will have a major impact on the sustainability of the construction and operation of toll roads include decisions / policies / regulations of the Government on the toll road investment.

### C. Risk Categorization

Categorizing conducted to determine the risk management measures that should be done by the parties responsible for the impact of a risk if the risk occurs. The risk categorization uses a Cartesian diagram with the following limitations:

Table 6 Risk Category Quadrant

Risk Category	Probability Value	Impact Value	Quadrant
Low Risk	< 0,40	< 0,20	III
Medium Risk	≥ 0,40	< 0,20	IV
	< 0,40	≥ 0,20	II
High Risk	≥ 0,40	≥ 0,20	I

The following is a diagram of risk categories according to investment stages (pre-construction, construction and post-construction):

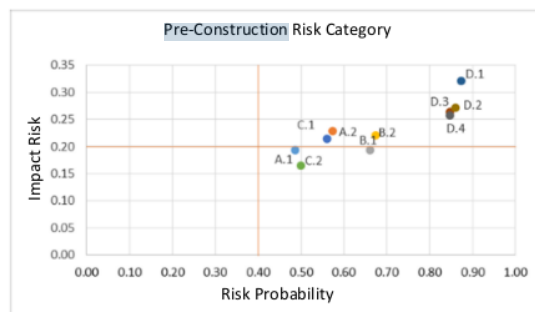


Figure 9 Pre-Construction Risk Categorization

Overall, in the pre-construction stage, the risk sub-group is dominated by high risk, which is in quadrant I.

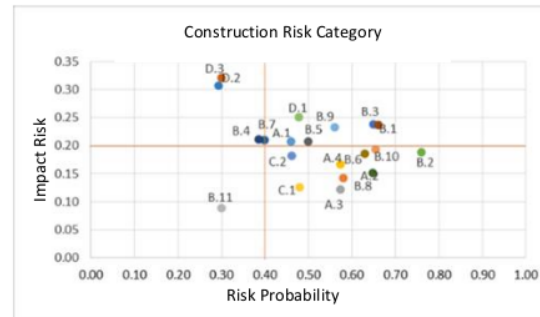


Figure 10 Construction Risk Categorization

Overall, in the construction phase, the sub-group dominated by the risk of moderate risk, which is in quadrants II and IV.

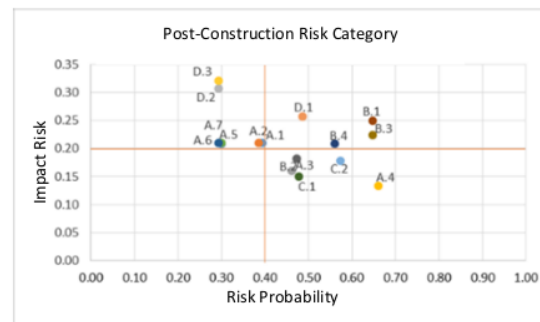


Figure 11 Post-Construction Risk Categorization

Overall, at the post-construction stage, the risk sub-group is dominated by moderate risk, which are in quadrants II and IV.

### D. The investment risk value of the Solo-Ngawi Toll Road

With a total development cost of IDR 11,341,853,000,000 and a first year operational cost (2018) of IDR 212,747,000,000 and income at initial operation (2018) of IDR 303,925,000,000 will be affected by several risks, namely: financing risk, development risk, force majeure risk, equipment risk, design risk, study risk, licensing risk and land acquisition risk.

In the risk coverage scheme options in Indonesia, the use of the guarantee system from PT. Penjaminan Infrastruktur Indonesia and use of insurance, however, not all risks are borne by the two agencies [11]. Insurance also does not cover all risks on toll road investments. The risk borne according to [12] is Force Majeur.

Apart from these two options, PT. Jasmarga Solo Ngawi prefers to face all risks. During the pre-construction and construction periods (no revenue), risk allocation comes from retention funds originating from investors (the amount of risk as a retention limit) which is reported in the preparation of Capital Expenditure. Meanwhile, at the time of revenue from traffic, the amount of risk is also considered as a limit on the retention rate (in percent) and is also reported in the preparation of the Operating Expenditure. According to [13], the retention limit can be set at 5% of toll road operating income before tax each year.

The following is a recapitulation of the calculation of the amount of risk in the Solo - Ngawi Toll Road project from the pre-construction to post-construction period:

Table 7 Recapitulation of Toll Road Investment Risk Value (in million)

Investment Costs (in Millions)									
No.	Description	Cost Value	Proportion	Affecting Risks	Probability	Impact	Risk Value	Risk Factors	Risk Category
					L	J		F1-F4-L-I-P	
a.	Construction Costs	IDR 7.294.147	64.31%	a. Infrastructure and Funding b. Construction c. Force Majeure	0.55 0.50 0.36	0.18 0.21 0.28	IDR 722.131 IDR 857.792 IDR 775.230	0.62 0.65 0.54	
b.	Toll Equipment	IDR 91.944	0.81%	a. Management	0.47	0.17	IDR 7.482	0.55	
c.	Design	IDR 167.091	1.47%	a. Design	0.30	0.19	IDR 15.974	0.60	
d.	Supervision	IDR 263.527	2.32%	a. Station b. Laboratory	0.67 0.53	0.21 0.21	IDR 37.078 IDR 29.331	0.74 0.63	
e.	Land Acquisition Cost	IDR 0	0.00%	a. Land acquisition	0.86	0.29	IDR 0	0.86	
f.	Evacuation	IDR 899.814	7.93%	a. Financing and Funding	0.55	0.18	IDR 89.082		
g.	VAT 10%	IDR 925.803	8.16%	a. Financing and Funding	0.55	0.18	IDR 91.654		
h.	Overhead Cost	IDR 543.501	4.77%	a. Financing and Funding	0.55	0.18	IDR 53.689		
i.	BIC	IDR 9.41.725	8.30%	a. Financing and Funding b. Land acquisition	0.55 0.86	0.18 0.29	IDR 93.231 IDR 234.866		
j.	Financial Cost	IDR 2.16.297	1.91%	a. Financing and Funding	0.55	0.18	IDR 21.413		
Total Investment Costs		IDR 11.341.853	100%				IDR 2.087.982		
Total Cost Increase due to Risk							26.34%		Medium Risk
Operational Cost (in 2018) (in Millions)									
No.	Description	Cost Value	Proportion	Affecting Risks	Probability	Impact	Risk Value	Risk Factors	Risk Category
					L	J		F1-F4-L-I-P	
a.	Maintenace Cost	IDR 64.294	30.22%	a. Operation and Maintenance b. Obligations	0.39 0.53	0.21 0.16	IDR 5.246 IDR 5.452	0.52 0.61	
b.	Toll Collection Management	IDR 80.102	37.65%	a. Force Majeure	0.36	0.28	IDR 4.481	0.54	
c.	Overhead Cost	IDR 68.352	32.13%	a. Operation and Maintenance	0.39	0.21	IDR 6.589		
Total Investment Costs		IDR 212.747	100%				IDR 23.299		
Total Cost Increase due to Risk							11.17%		Medium Risk
Toll Revenue from Traffic in 2018 (in Millions)									
No.	Description	Cost Value	Proportion	Affecting Risks	Probability	Impact	Risk Value	Risk Factors	Risk Category
					L	J		F1-F4-L-I-P	
a.	Total Revenue from Traffic	IDR 303.925		Total Revenue	0.57	0.22	IDR 38.112	0.66	
Total Revenue		IDR 303.925					IDR 38.112		
Total Cost Increase due to Risk							12.54%		Medium Risk

## CONCLUSION

The overall risk based on Pd T-01-2005-B, affects the operation of the Solo-Ngawi toll road with the results of a moderate risk analysis. For the risk probability value of the analysis results at the pre-construction stage is higher than the guideline with the highest probability value from the pre-construction to post-construction stages, respectively, namely the risk of land availability, the risk of weather effects and the risk of the accuracy of estimated traffic volume. Meanwhile, from the results of the analysis, the impact value of toll road investment risk for the pre-construction-post-construction stages is overall lower than the guideline with the highest risk impact from the pre-construction to post-construction stages, respectively, namely the risk of land availability and the risk of political turmoil. From the calculation of the risk of operating the Solo-Ngawi toll road, the amount of risk that occurs is 26.05% of the investment cost and 11.28% for operational

costs, while for revenue from traffic the amount of risk is 12.34%.

From this research, there are several suggestions to be taken into consideration in determining investment and developing this study, namely the need for periodic evaluation of guidelines on Toll Road Investment Risk Analysis to be more accurate in analyzing risks, increasing the number of respondents and there is a need for research related to toll road investment guaranteed by PT. PII to determine the types of risk and the amount of risk guaranteed by it.

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