Journal of Construction in Developing Countries, 17(2) 2012, 45–66, 2012

Public-Private Partnerships for Tollway Construction and Operation: Risk Assessment and Allocation from the Perspective of Investors

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Abstract: This study aims to assess and allocate the key risk events for public-private partnerships in Indonesian tollway construction and operation. The data were collected from a risk assessment survey of tollway companies in Indonesia based on two perspectives: the degrees of occurrence and impact. The top-ranked risk events (18 out of 55 risks) generated from the value-of-risk index are the focus of this study and the relationships among risk events are analysed and explained using risk mechanism models. Risks related to land acquisition were identified as the major risk events in the Indonesian tollway business and 10 out of the 18 top-ranked risk events were judged as suitable for assumption by the government. The weather risk should be shared by both parties with the remaining risks borne by the investor. The findings are expected to be useful for government review of regulations and practices and for private sectors interested in investing in tollway projects.

Keywords: Developing countries, Risk, Assessment, Infrastructure, Cooperation, Indonesia

INTRODUCTION

Risks are perceived as threats to project success or as opportunities to enhance the chances of project success (Project Management Institute, 2004). Properly selected and accurate information is crucial for risk assessment, especially for investment in large infrastructure projects. In many cases, risks are underestimated and allocated to parties that lack the knowledge, resources and capabilities to manage those risks effectively (Ng and Loosemore, 2007). Clear information as to what investors can expect and may face will assist them in considering and justifying their decisions. Additionally, with an awareness of the risks that they will face, investors can prepare the necessary plans to anticipate and mitigate risks such that calculation of project feasibility can be clearly and systematically forecasted.

Many countries are currently considering the involvement of the private sector in infrastructure development through the use of public-private partnerships (PPPs). The participation of the private sector in public infrastructure is expected to increase efficiency and reduce the financial burden on the government. Many avenues exist for the private sector to participate in public infrastructure development, from a simple arrangement with less investment, such as providing service or management for the infrastructure, to complex participation with large investment, such as the build-operate-transfer model. In tollway infrastructure development in Indonesia, the participation of the private sector is greatly needed to meet the demands for accessibility and mobility because the total

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length of the current tollway in Indonesia is far below the level needed to support economic growth (*Kompas*, 2008; 2009).

Private involvement in the infrastructure sector is different from that of the service sector, primarily because infrastructures such as roads are expensive, capital-intensive, long-term and immobile (Gomez-Ibáñez and Meyer, 1993). One of the major constraints in attracting private investors to this sector is the risk management between investors (private companies) and governments, which has not been systematically carried out or properly provided for in agreements until now. Additionally, it has been argued that much of the risk in a PPP project comes from the complexity of the arrangement itself (Ng and Loosemore, 2007; Grimsey and Lewis, 2002). Meanwhile, wholly and naïvely adopting risk management concepts from developed countries may not be a wise option because the key problems that exist in such developing countries as Indonesia may not be the same as those in developed countries. An inappropriate distribution of risks may create new risks (Cooper et al., 2005) or lead to project failure (Ng and Loosemore, 2007). Risk should be allocated to the party that is best able to manage it at the lowest cost (Cooper et al., 2005; European Union, 2003). This paper attempts to fill the gap by assessing the important risk factors in tollway construction and operation and by properly allocating the risks to the party best able to manage those risks from the perspective of the investors.

Tollways and Risk Management in Infrastructure Development in Indonesia

From 1978 to 2005, only 22 toll roads with a total length of 608 km were built and under operation in Indonesia (Badan Pengatur Jalan Tol, 2009). This number is quite low for such a large country as Indonesia in which land transportation is still a major infrastructure needed to support economic growth. The prior development of toll roads in Indonesia was carried out by PT Jasa Marga, the first tollway company in Indonesia and a state-owned enterprise. The initial participation of private investors in the toll road was limited under a joint venture scheme with PT Jasa Marga because, at that time, Indonesian law stated that only PT Jasa Marga was able to own and operate a toll road. Another Indonesian law mandated that the toll road right-of-way was owned by the government such that clearing and construction of the site should be authorised only by the government (Gomez-Ibanez and Meyer, 1993).

Considering the need for infrastructure development to boost economic growth, a plan to encourage participation from the private sector was unveiled during the Indonesian Infrastructure Summit in 2005. After the summit, three additional toll roads have become operational. These 25 toll roads consist of a 677 km length of road, of which 516 km are operated by PT Jasa Marga. The remainder are operated by other private firms (BPJT, 2009). At present, five additional toll roads are in the construction phase with a total length of 97.70 km. Up until 2011, operation agreements for 20 sections of toll road with a total length of 736.18 km have been signed.

The latest plan is to build a tollway connecting the western and eastern region of Java Island, from Merak, Banten to Banyuwangi, with a total length of 1657 km by 2010 (*Tempointeraktif*, 2007). At present, only seven companies currently operate the toll roads in Indonesia. With the intensive expansion of the tollway infrastructure, additional companies have been awarded contracts for the

new tollway systems, a portion of which are currently under construction (BPJT, 2009).

The general procedure for risk allocation between the government and the private sector in infrastructure development is regulated by the Decree of the Ministry of Finance (38/PMK.01/2006). This decree is specifically intended as a guideline for controlling and managing the risks in the provision of infrastructure, including items related to contingent liabilities that have a potential to burden the government financially in the future. The decree demonstrates the government's willingness to share in project risks with investors and risk is broadly defined to include political, project performance and demand risks. However, this 10-page decree provides only general guidelines for controlling and managing risks. Only a few details regarding allocation and sharing of risks and operation and implementation of project risks have been translated into rules or regulations related to PPP projects. Much work still remains to improve and encourage participation from the private sector, including foreign investors.

A study of risk management in Indonesian construction projects has not yet been fully explored and only limited references exist in the international literature, e.g., Santoso, Ogunlana and Minato (2003a; 2003b), Wibowo and Kochendoerfer (2005), Abednego and Ogunlana (2006), Wiraguna and Scott (2006), Voelker et al. (2008) and Wibowo and Mohamed (2010). From this list, four authors analysed aspects of risk related to PPPs and only two out of four are linked to PPPs in toll roads, i.e., Wibowo and Kochendoerfer (2005) and Abednego and Ogunlana (2006). The first example is specific to financial risk analysis and the second discusses good project governance for risk allocation. Sagalyn (2007) identified three generations of a public-private (PP) development "learning process" in which the public and private partners learned by doing in the first generation, followed by the establishment of companies specialised in this type of project. With intensive and extensive experiences in PPP projects that produced clear and well-organised policies, rules and regulations, a third generation will emerge in which PPP projects are initiated by private developers seeking public sector involvement. In this process, the involvement of the private sector in tollway construction and operation can still be categorised as first generation. Therefore, there are many opportunities for exploration and improvement of PPP in Indonesia.

RESEARCH METHOD

In this study, the analysis is focused on two main parties involved in the PPP: the government, which represents the public sector and the tollway companies, which are the investors that represent the private sector. Other parties that may be involved in this partnership scheme, such as banks and insurance firms, are assumed as not directly involved in the partnership. Their influence or involvement in the project is covered or represented either by the government or by the investor through risk transfer. Therefore, this study concentrates solely on these two main players.

The secondary data for this article are obtained from two main sources. The first contains documents related to the tollways (e.g., feasibility studies, business plans, contracts, agreements or reports), which were collected from the tollway companies (investors) and the government. This group of documents

includes interviews intended to gather better and more practical information on tollway construction and operation (e.g., good practices in PPP, concession systems or financial aspects). The second source includes research papers on this topic for inputs on the theoretical and actual practices in other countries that may be considered for possible adoption in the Indonesian context.

The primary data were collected by qualitative risk assessment through distribution of questionnaires to the tollway companies involved in the operation and construction of toll roads in Indonesia. Most are consortium companies established specifically for the project. The target respondents for the survey are key personnel at the management levels with many years of working experience, including a minimum of two years of direct involvement in risk management. Interviews and discussions were also conducted during the distribution of the questionnaires. It should be noted that at the time of this research, in addition to PT Jasa Marga (the first tollway company in Indonesia and a state-owned enterprise), there were only eight toll roads operated by private companies and another eight toll road projects under private companies in the construction stage. The available target respondents are quite limited in number; therefore, the research also put strong emphasis on interviews and discussions with respondents.

Because this research was funded by the Ministry of Public Works, previous reports on the guidelines with respect to risk analysis for investment in toll roads published by the Ministry of Public Works (2005) were adopted as a reference. The guidelines have identified 55 risk events for the toll road investments in Indonesia. These risk events are categorised into nine categories: (1) political and legislative, (2) risks to tollway companies, (3) economic and monetary, (4) design, (5) land acquisition, (6) construction, (7) traffic, (8) maintenance and operation and (9) force majeure.

A questionnaire survey covering the 55 risk events was designed to collect primary data and followed by a pilot study to minimise any possible ambiguities or confusions in the content, language and format. The survey was conducted in August and September of 2008. The questionnaire administrators were dispatched to tollway companies located in Jakarta, Bandung and Surabaya. Two companies located outside Java Island (Medan and Makassar) were also targeted for the survey. The questionnaire administrators were sent to the companies to explain the research in additional detail and to ensure that the questionnaire was delivered to suitable respondents. Interviews were also conducted with the respondents during the visit.

To be eligible for the survey, all respondents were required to have direct experience in dealing with the risk management aspects of tollway construction and operation. In the questionnaire survey, the respondents were asked to assess the risk events from two perspectives based on their experience and professional judgment: the degree of occurrence and the impact of the risk. The assessment was given an ordinal rating using the 5-point Likert scale in which 1 represents very low impact and 5 represents very high impact for degree of impact and for degree of occurrence, 1 indicates that it is very unlikely that the risk will occur and 5 indicates that it is almost certain that the risk will occur. In total, 19 people responded to the survey. However, only 15 respondents gave the responses necessary to cover all risk events for this study. All of these respondents were at least undergraduate degree holders, two respondents had positions as project directors and four respondents were at the managerial level with two of them in

risk management and the others in operations management. The remaining respondents were members of the company's expert team. Six respondents had more than six years of practice in risk management. Five respondents had been involved in risk management for four to six years and the rest had at least two years of risk management experience. Considering the limited number of tollway companies operating in Indonesia during the time of survey, this amount was deemed to be sufficient. The tollway projects associated with the respondents were found to sufficiently represent the regional distribution in Indonesia, i.e., western and eastern parts of Indonesia.

Analysis of Results

The degree of occurrence of a risk measures the likelihood that the risk will occur. Additionally, the risk impact assessment evaluates the potential effect of the risk on the project objectives. Using the inputs of the respondents on the degrees of risk occurrence and risk impact, a risk index (RI) can be calculated by multiplying the mean value of the occurrence of risk with the mean value of the risk impact.

$$RI = \text{Mean (Occurrence)} \times \text{Mean (Impact)} \quad (1)$$

The same approach was also applied by Roumboutsos and Anagnostopoulos (2008) and Shen, Wu and Ng (2001) with discussion from Tsu (2002) for ranking the risk events in their research.

The values of the risk index are ranked in Table 1. The means for occurrence and impact of each risk are calculated from the respondents' assessments of the risk events. Observations of the means of risk occurrence and risk impact indicate that the respondents seem to give higher scores to the impact rather than to the degree of occurrence. The results also show that the range of the mean of occurrence (1.40–4.13) is wider than the range of the mean of risk impact (1.67–4.00). One possible explanation for this result is that it is easier to measure occurrence because the respondents may have direct experience with the occurrence of a risk. However, it is not as easy to measure or to assess the magnitude of the impact and this may influence the tendency of respondents to give a higher score to impact than to occurrence.

A correlation between risk events is very likely to exist. However, grouping of risk events into a more comprehensive and collective risk group to capture the correlation effects using statistical methods is not appropriate in this work due to the small number of respondents. To minimise this problem, an influence diagram explaining the relationships among risk events was constructed such that the possible correlations among the top-ranked risk events can be observed and other risk events that influence or are influenced by the top-ranked risk events can be expressed. The top-ranked risk events are defined as risk events that have means of occurrence and impact that are both higher than 2.5. This value is used as a reference with the expectation that it will extensively cover all important risks in terms of their occurrence and impact, instead of using the first 10 risk events, an approach that was commonly used in other risk-related studies. Using this definition, Table 1 shows the 18 top-ranked risk events within the bold line.

Table 1. Risk Index

Code	Risk Event	Occurrence		Impact		Risk Index	
		Mean	Rank	Mean	Rank	Score	Rank
R28	Delays in land acquisition	4.13	1	4.00	1	16.53	1
R30	Over budget in land acquisition	3.80	2	3.80	2	14.44	2
R40	Low traffic volume	2.93	6	3.80	3	11.15	3
R7	Long procedure for decision and approval by government	3.13	4	3.36	7	10.52	4
R42	No increment in toll fee	2.87	8	3.60	4	10.32	5
R12	Delays in disbursement of funds from investors	2.79	9	3.43	5	9.55	6
R35	Cost over-run in construction	2.87	7	3.20	14	9.17	7
R29	Delays in payment related to land acquisition	2.73	11	3.27	12	8.93	8
R27	Project feasibility	2.60	15	3.40	8	8.84	9
R20	Inflation	2.67	12	3.27	11	8.71	10
R15	Credit related problems	2.57	16	3.36	10	8.63	11
R10	Inability of government to fulfill its responsibilities	2.60	14	3.27	13	8.49	12
R38	Severe weather causes low productivity	2.67	3	3.17	41	8.46	13
R31	Claim from community related to land right	2.93	5	2.87	26	8.41	14
R19	Interest rate fluctuation	2.73	10	3.07	15	8.40	15
R43	Fail in constructing the road feeders	2.67	13	3.07	17	8.18	16
R8	Delays in issuing permits by government	2.53	17	3.13	18	7.94	17
R32	Delays in construction	2.53	18	3.07	24	7.77	18
R44	Change in plan of road network which directly affecting the tollway	2.40	19	3.00	20	7.20	19
R25	Design change requested by government	2.20	28	3.20	16	7.04	20
R11	Problem with public acceptance	2.36	21	2.86	31	6.73	21
R47	Unpredicted increment in operational cost	2.40	20	2.80	32	6.72	22
R9	Coordination problem among government agencies related to tollway	2.33	23	2.87	27	6.69	23
R13	Problem in managing income	2.15	29	3.08	19	6.64	24
R5	Change in policy and regulation related to tollway	2.07	32	3.20	21	6.61	25

(*continued on next page*)

Table 1 (*continued*)

Code	Risk Event	Occurrence		Impact		Risk Index	
		Mean	Rank	Mean	Rank	Score	Rank
R14	Agreement related problems	2.29	26	2.86	30	6.53	26
R21	Bankruptcy of consortium's member or subcontractor	2.13	31	2.93	29	6.26	27
R46	Unpredicted increment in personnel cost	2.33	25	2.67	39	6.22	28
R16	Regulation related problems	2.29	27	2.71	37	6.20	29
R3	Expropriation of the project by government	2.00	34	3.07	25	6.13	30
R4	Change in environmental policy and regulation	2.13	30	2.87	33	6.12	31
R2	Breach or cancellation of contract	1.60	48	3.73	6	5.97	32
R1	Instability and insecurity of the region	1.71	46	3.46	9	5.93	33
R26	Competition in tender	2.36	22	2.50	42	5.89	34
R18	Exchange rate fluctuation	2.33	24	2.47	43	5.76	35
R36	Lack of skilled or experienced workers	2.07	33	2.71	38	5.61	36
R54	Natural force majeure (act of God)	1.60	50	3.40	22	5.44	37
R6	Change in business policy and regulation	1.80	43	3.00	28	5.40	38
R17	Restriction in financial transaction	1.86	42	2.86	34	5.31	39
R52	Environmental related problems	2.00	35	2.53	46	5.07	40
R55	Political force majeure (war, riot)	1.47	54	3.40	23	4.99	41
R33	Problems with subcontractors	1.87	40	2.67	40	4.98	42
R34	Over budget due to new safety standard and environmental policy	1.93	36	2.53	47	4.90	43
R39	Change in construction plan due to third party interference	1.93	37	2.53	44	4.90	44
R50	Low achievement of tollway operator	1.73	44	2.80	35	4.85	45
R24	Faults in contractor's design	1.87	39	2.53	45	4.73	46
R23	Lack of design innovation	1.87	38	2.40	48	4.48	47
R22	Faults in tender specifications	1.60	49	2.73	36	4.37	48
R37	Problems related to construction materials	1.87	41	2.29	49	4.27	49
R51	Technology related problems	1.67	47	2.20	52	3.67	50
R53	Asset transfer problems	1.73	45	2.07	51	3.58	51
R48	Increment of import fee	1.53	52	2.33	50	3.58	52

(*continued on next page*)

Table 1 (*continued*)

Code	Risk Event	Occurrence		Impact		Risk Index	
		Mean	Rank	Mean	Rank	Score	Rank
R41	Faults in toll system application	1.53	51	2.00	53	3.07	53
R49	Low traffic volume due to severe weather	1.47	53	1.93	54	2.84	54
R45	Road users do not pay toll fee	1.40	55	1.67	55	2.33	55

The top-ranked risk events from Table 1 were allocated to the project stages based on the possible occurrences of the risks as displayed in Table 2. As shown in the table, eight risk events are linked with the land acquisition stage and nine risk events are associated with the construction stage. This observation strongly indicates the importance of land acquisition in tollway projects in addition to the construction process.

Risk Factors of the Top-Ranked Risk Events

In this study, the model proposed by Niwa (1989) for interpreting the risk mechanism concept in the form of a diagram was modified to explain the risk factors of the top-ranked risk events. In his model, Niwa grouped the risk events into environmental factors, which are not directly controlled by the contractor and managerial or operational factors/errors, which are directly controlled by the contractor. In this study, the risk events were categorised into three groups. One group consists of risk events that are controlled by the government and the second consists of risk events controlled by the investors. The third group is the shared risk group, if it exists. With this arrangement, risk events were also grouped together if any relationships existed among the risk events to provide a better explanation and a more extensive understanding of the interactions. The risk factors in the models were identified in discussions with two independent experts and three senior engineers with direct experience in risk management of a PPP project as well as the tollway companies.

Risk Mechanism with the Main Focus on Land Acquisition

The risk mechanism diagram for the abovementioned risk events is presented in Figure 1. Land acquisition has been identified as a major issue in the construction of tollways. Land acquisition/resettlement was also identified by Shen, Wu and Ng (2001) as one of the top 10 risks in Chinese construction joint ventures. To aid the government in acquiring land used for the construction of public facilities, the Regulation of the President of the Republic of Indonesia No. 36 on the Land Procurement for Implementation of Development for Public Interest was issued in 2005 and later amended with No. 65 in 2006. However, land acquisition is still a major problem in terms of time and money. The delays (R28) and budget overruns in land acquisition (R30) are not only the first two risk events with the highest risk index, but they are also the first- and second-ranked items for degrees of risk impact and occurrence.

Table 2. The Allocation of Top-Ranked Risks in the Project Stage

Rank	Code	Risk Event	Development	Pre-Construction		Construction	Operation
				Detailed Design	Land Acquisition		
1	R28	Delays in land acquisition			•		
2	R30	Over budget in land acquisition			•		
3	R40	Low traffic volume					•
4	R7	Long procedure for decision and approval by government	•				
5	R42	No increment in toll fee					•
6	R12	Delays in disbursement of funds from investors			•	•	
7	R35	Cost over-run in construction				•	
8	R29	Delays in payment related to land acquisition			•		
9	R27	Project feasibility	•	•			
10	R20	Inflation		•		•	•
11	R15	Credit related problems		•	•	•	
12	R10	Inability of government to fulfill its responsibilities		•	•	•	•
13	R38	Severe weather causes low productivity				•	
14	R31	Claim from community related to land right			•		
15	R19	Interest rate fluctuation				•	
16	R43	Fail in constructing the road feeders					•
17	R8	Delays in issuing permits by government		•	•	•	•
18	R32	Delays in construction				•	

The results of the survey showed that the risk of delays in land acquisition has more influence both for the impact and occurrence than the budget overrun risk for two important reasons. The first is the delay risk directly related to project feasibility and commencement of construction; without land, investors cannot begin the construction and project feasibility is left hanging without certainty. The second is because the other six top-ranked risks (R7, R10, R12, R15, R29 and R31) contribute to the delays in land acquisitions. Therefore, additional attention should be focused on remedying this delay risk.

Even with the regulations, the procedures and mechanisms of land acquisition do not give the investor confidence in the land acquisition process. If problems occur with the landowners and they refuse the offered compensation up until the deadline, based on the regulations, the committee for land acquisition can proceed with consignment and the procedure may move forward to revocation of the property rights of the landowners as a last resort if no agreement can be reached. However, the process of revoking the property right involves many parties and several steps before it goes to the president for a final decision. This process is time-consuming (R7) and carries a high probability of causing delay (R28).

The inability of government to strictly impose a law or regulation (R10) on land acquisition has made the process more lenient. The friendly manner of discussion and negotiation approaches (*musyawarah*) in land acquisition encourages landowners to refuse to sell the land and to be eventually evacuated from their lands in many cases, usually with low offered price for the land as the reason. The *musyawarah* approach is, by nature, a good and courteous approach to discussing or solving problems with the intent of avoiding conflicts and is based on the eastern culture of respecting others. However, the acquisition process usually takes longer if this approach is subsequently used for negotiating instead of for socialising the acquisition. It is expected that the government should be more decisive so that time is not wasted in the process. Additionally, claims from the community related to land rights (R31) have complicated and prolonged the acquisition process.

The increment of acquisition cost is also partially attributed to land speculators who buy land from lay people to resell at a higher price and by land brokers who act as middlemen for certain residents by promising a higher price for the land. At the present time, there is no clear government policy that strictly prevents these practices. The *musyawarah* approach also allows land brokers and speculators to demand higher land prices.

All of these drawbacks have made land acquisition a time-consuming and costly process. One extreme case of land acquisition problems is the example of the Depok-Antasari tollway in which the actual cost for land acquisition was three times higher than the estimated cost (*Koran Tempo*, 2008). This problem exists not only in Indonesia but also in Thailand, as in the case of the construction of rail transit (Bangkok Skytrain) in Bangkok (Phang, 2007).

Another issue in land acquisition is the availability of cash. The land acquisition committee will not approach the landowners before the committee is certain that the money is available. Because the land acquisition cost is still borne by the investors, the availability of funds (R15) and disbursement of funds from the investor (R12) are crucial to smoothing and speeding the acquisition process.

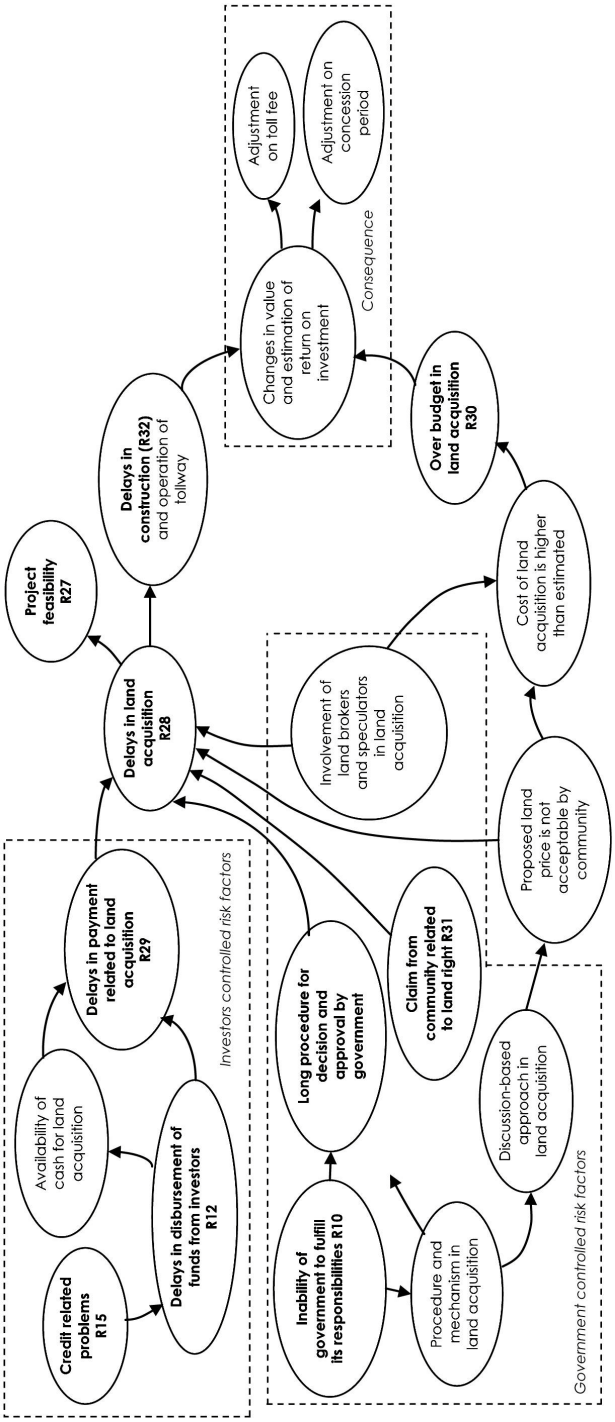

Figure 1. Risk Mechanism with the Main Focus on Land Acquisition

A delay in cash availability means a delay in payment (R29) that will consequently delay the acquisition (R28). However, because investors are usually time-conscious, cash availability is not often the problem and its contribution to prolonging the land acquisition process is relatively small compared with the other factors explained in the previous paragraph. Therefore, most of the applicable factors are under the control of the government.

If the land is not ready, the tollway cannot be built. Therefore, delays in acquiring the land will delay the construction (R32) and subsequently, the operation of the tollway. This risk also influences the feasibility of the project (R27). Considering the importance of this risk, it was ranked first for both the degrees of impact and occurrence. The delay risk with the risk of an additional cost of acquiring the land (R30) will change the entire expectation of the investment scheme, particularly the estimation of return on investment. Because most of the sources of problems are not under the control of investors, the government can compensate the investor by providing a longer concession period or reviewing the toll fee agreement.

Because land acquisition has become a source of frustration for investors, a land capping agreement has been implemented for certain tollway agreements. With the land capping clause of 110%, if the cost of land acquisition soars, the investors are now only responsible for a maximum of 110% of the estimated land acquisition cost and the remainder should be shouldered by the government. A funding scheme has been additionally established by the government to lend cash for land acquisition through the Agency Fund for Public Services (*Badan Layanan Umum*). Although the policy provides a safeguard for the investor only in financial terms and not in terms of time, it is expected to rebuild the private sector's confidence in tollway investment. There is a strong suggestion from investors that the entire process of land acquisition, including financing, should be taken over by the government so that investors can focus solely on the construction phase. In research on PPPs in construction projects in various countries, Li et al. (2005) in the UK, Shen, Platten and Deng (2006) in Hong Kong, Roumboutsos and Anagnostopoulos (2008) in Greece and Ke et al. (2010) in China also concluded that the risk of site availability is better retained by the public sector because the government has the experience and resources to address this risk, particularly in the legal power to ensure that the required land is obtained. However, at this moment, this suggestion is still under consideration in Indonesia.

Risk Mechanism with the Main Focus on Traffic Volume and Toll Fee

Traffic volume is one of the main factors influencing the investors' decision to invest in a tollway. Grimsey and Lewis (2002) emphasise that PPP projects are viable only if a reliable, long-term revenue stream can be established, which makes revenue risk the greatest risk to the commercial feasibility of a project. However, it is difficult to accurately predict traffic volume, especially for the long term. In their study, Wibowo and Kochendoerfer (2005) found that traffic on a toll road has a significant impact on the cash flow of investors and creditors, particularly in the first year of operation.

As in many investment decisions, investors must carry out their own estimations, judgments and decisions whether to invest in the project based on the available information. The estimation of demand may include the planned road

construction that will feed the tollway (R43). Whatever information is used to analyse the demand, it is up to the investors' judgment to include or exclude the various parameters in their estimation depending on the level of risk they are willing to accept. A tollway project can be considered as an investment project and thus the risks related to income should be borne by the investor. Additionally, there is also the possibility that the government may change the road network to better serve the public in a way that directly affects the users of the tollway.

Many planned toll roads did not materialised because the investors were not interested in the projects due to financial feasibility and low traffic volume (R40). In a situation where there is no strong indication that traffic volume will provide sufficient income for the investor, governments may share the risk to attract investors. Two possible schemes exist for this purpose. First, the government guarantees a minimum traffic volume such that if the volume falls below the minimum figure, it will be the responsibility of the government (downside risk protection). However, when the actual traffic volume is higher than that predicted, the difference will be allocated to the tollway company. The second scheme is downside risk protection with a clawback provision, a modification of the first scheme with an agreement that the government guarantees the minimum traffic volume; however, if the traffic volume is higher than the minimum figure, the difference should be shared with the government.

Previously, the Indonesian toll road regulations specified that all toll increases are at the discretion of the president, which was problematic for private investors, particularly those without any political connections (Gomez-Ibáñez and Meyer, 1993). However, with the Government Regulation No. 15/2005 regarding toll roads, the toll fee will be reviewed and adjusted every two years. However, the adjustment is calculated with reference to the existing fee and the inflation rate. The decision ultimately belongs to the concerned Minister and political issues often have a stronger role in the decision than inflation or business considerations. As indicated by Wells and Gleason (1995), infrastructure projects are quite vulnerable as a target of opposition politicians to discredit the government. Changes in policy and regulations related to roads or tollways may also directly affect the toll fee decisions. If there is an indication of appropriation of the tollway by the government, the above two risk factors will most likely reduce the investor's profits (Phang, 2007). All of these factors are regulated by the government.

Traffic demand forecasting is never an easy task and is generally unable to produce certain and absolute results. The uncertainty of these forecasts remains quite high, depending on the available data for forecasting. Additionally, another important risk related to the construction of the road feeders (R43) also directly contributes to the increase or decrease in the traffic volume. Therefore, the risk of traffic volume, with a risk index of 11.15, is more considerable than the risk of toll fee increase (risk index: 10.32) both for impact and occurrence. The provisions of Government Regulation No. 15/2005, which regulates the toll fee as previously explained, may also reduce the concerns of the investors in the toll fee risk relative to the demand risk.

Low traffic volume (R40) and no increment in toll fee (R42) are two risk events that directly relate to income. If the income is less than the forecast or the operational cost cannot be covered by income, there is a strong tendency to reduce the maintenance cost, which influences the level of service to the users. Therefore, it is important that the quality of service should be clearly specified in

the agreement to avoid this conflict (Hard, 2003). For the case of Indonesia, a minimal standard of service (*standar pelayanan minimal*, SPM) has been established and implemented for this purpose. Income less than that projected also affects the ability of the investor to pay debt to creditors. If the situation continues and causes financial problems (cash flow and financial distress), debt restructuring may be carried out. The diagram explaining these two risk events is shown in Figure 2.

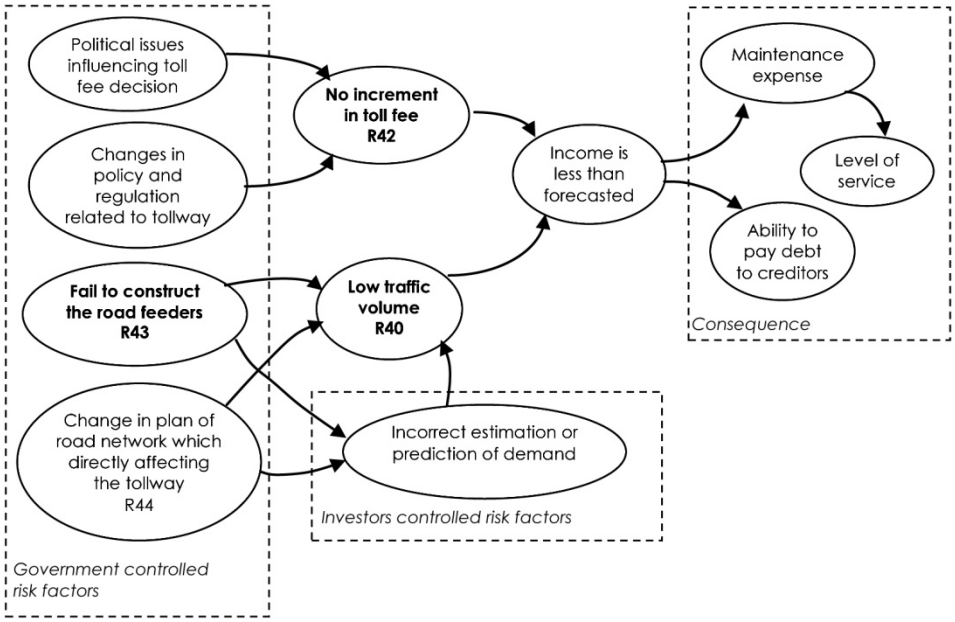

Figure 2. Risk Mechanism with the Main Focus on Traffic Volume and Toll Fee

Risk Mechanism with the Main Focus on Cost Overrun

Cost overrun has been identified as one of essential risks in the construction stage of a PPP project and is typically affected by design changes instigated by the public sector client (Bain, 2010). The survey result positioned this risk in seventh place. Referring to the allocation of risks in the project stage, as shown in Table 2, the cost overrun risk is ranked second after delays in disbursement of funds from investors (R12) and is among the top-ranked risks in the construction stage. However, it should be noted that the degree of occurrence for this risk (2.87) is higher than that of the delay in fund disbursement (2.79), which indicates that this risk was considered to occur more often than the fund disbursement risk.

Provisions for new safety standards and environmental policies imposed by the government may have an impact on the project cost as well, as shown in Figure 3, but compensation for this cost can usually be sought. The government can intervene in the construction phase by requiring change orders which, depending on their magnitude, may influence the total construction cost and time. The change orders may be carried out because the design revision is

necessary for certain technical reasons. It is also possible that change orders are pursued due to political reasons (third party interference, R39). However, if the government does request change orders that cause additional costs and time, the investor can normally claim cost reimbursement and time extension by contract agreement. Similar to the case of new safety and environmental related policies imposed after the contract agreement, investors are generally eligible for compensation under the contract agreement.

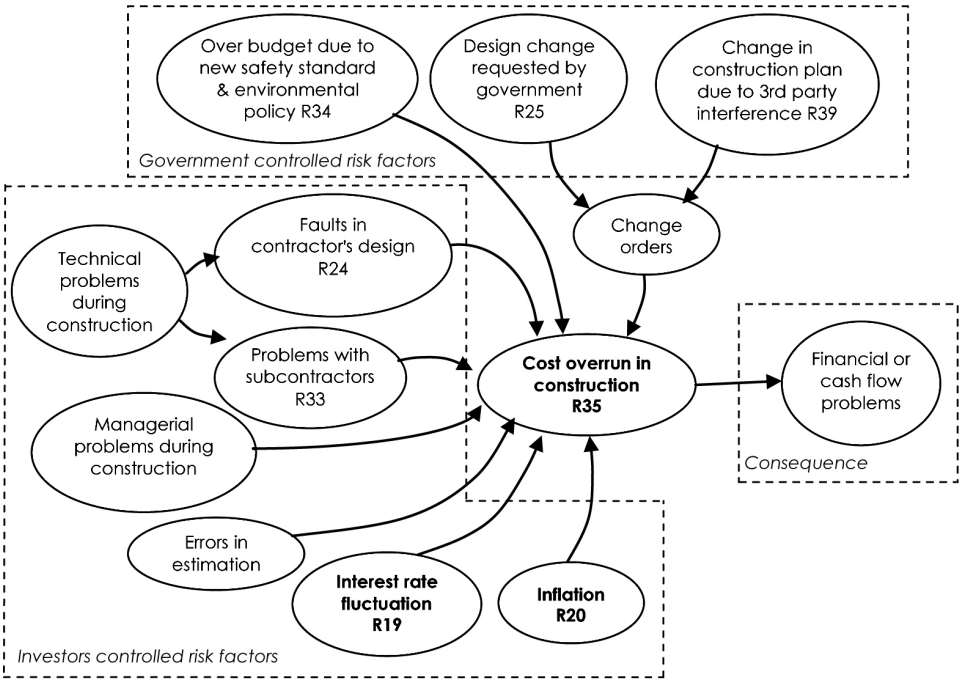

Figure 3. Risk Mechanism with the Main Focus on Cost Overrun

Other factors, such as managerial and technical problems during construction and errors in estimation, should remain the responsibility of the investor as the planner, executor and manager of the construction process. Therefore, the risk of cost overrun in the construction phase is primarily under the control of investors because government involvement is relatively minimal at this stage.

Interest rate fluctuation and inflation (R20) are factors that are managed to a certain extent by the government through control of the money supply using interest rates, open market operations and setting of banking reserve requirements to balance the money supply and economic growth (Taylor, 2008). However, before investing in a project, an investor should analyse these factors in the business plan. For the operation of toll roads in Indonesia, the inflation rate is one factors that has a significantly influence in the toll fee adjustment. Thus, all possible inflation rate fluctuations should be considered in advance so that a case such as the Malaysia North-South Highway, which suffered a 75% cost overrun largely due to an inadequate allowance made for inflation (Ng and Loosemore, 2007), can

be avoided. With this consideration, the inflation and interest rate fluctuations are assigned to the investor as a risk of investing. These allocations are quite surprising, especially considering that this perspective comes from the investors. The result is somewhat in line with PPP research in the UK (Li et al., 2005), which is deemed a mature PPP market. The inflation risk for PPP construction projects in UK is allocated primarily to the private sector but with perceived opportunities for sharing with the government. Meanwhile, the interest rate fluctuation is solely the responsibility of the investor (Li et al., 2005). Phang (2007) (in his research on urban rail transit PPPs) and Cooper et al. (2005) also concluded that these two risks are better allocated to the private sector (investor). Other studies (Ke et al., 2010; Roumboutsos and Anagnostopoulos, 2008; Grimsey and Lewis, 2004) considered that both risks should be shared or negotiated. The reasons for this perspective may be that both parties may not be able to handle these issues alone and investors have little influence over such volatility. The role of the government in influencing the inflation and interest rates may also contribute to the shared consideration. Problems with cost overrun will certainly influence the financial situation or the cash flow of the project as a result.

Risk Mechanism with the Main Focus on Project Feasibility

The risk of project feasibility falls in the earlier stages of a project (development, detailed design and land acquisition) and is ranked ninth in the list. The risk mechanism diagram for project feasibility is illustrated in Figure 4. At the development stage during which bid documents are prepared, possible unfairness in the bidding process or an unreasonable stipulation in the bid or contract document may force an investor to withdraw. Assuming that fairness in the bidding process, this stage still contributes to a high degree of uncertainty for investors due to competition in tender (R26). The bidders should also finance several costs to provide the proposal and to participate in the tender process, including the cost of constructing a construction and business plan, which is a cost that will not be recovered if the candidate does not win the bid. Even after the project is awarded to the winner, execution problems in land acquisition may require more time and/or money than expected. The prolonged delays and the soaring costs of land may cause the investor to think twice as to whether to continue the project. Therefore, the impact of this risk is relatively higher than the degree of occurrence compared with other risks in the top 10 list.

Problems in land acquisition (R28 and R30) may be politicised to discredit the government (Wells and Gleason, 1995) and may end with shifting the location of toll route as a solution. This solution will certainly change the layout (R25) and, in most cases, will usually incur additional cost and longer time to completion. Interference from a third party (R39) with political influence in the name of public interest may also affect the feasibility of the project in the worst case. If the project can proceed, it may need to be rerouted or redesigned as a result. These problems may also force the investor to abandon the project if no reasonable compensation is offered to justify the variation. Limited information gathered during the tender stage may not equip investors with sufficient data with respect to the ground conditions and assumptions may need to be made in the analysis. If the ground condition is highly different from the available information and significantly influences the total cost of the project, the investor may reconsider

the continuation of the project. Special clauses in the contract agreement are recommended for sharing this risk. Nevertheless, the degree of occurrence of this risk (reaching an extreme case) is quite small.

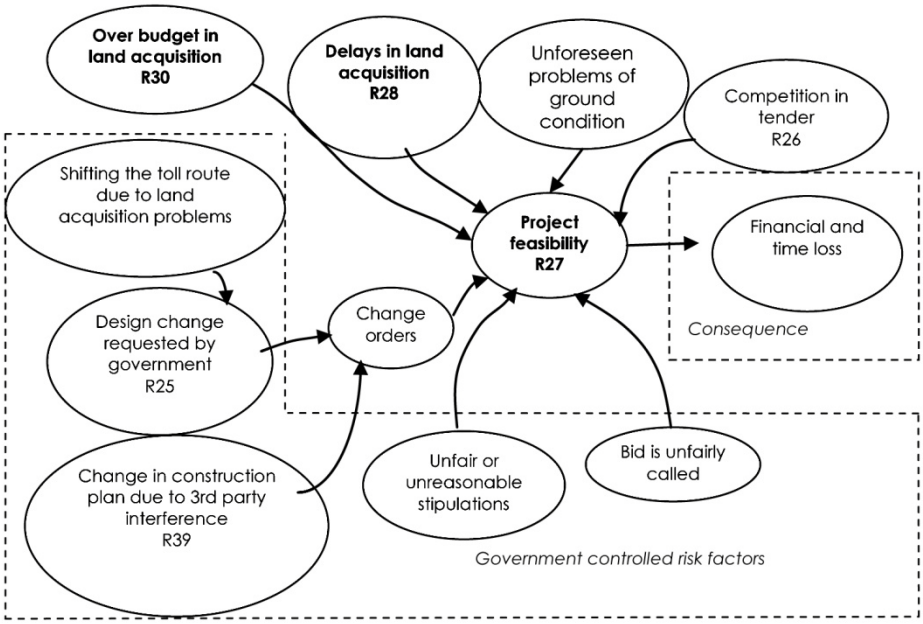

Figure 4. Risk Mechanism with the Main Focus on Project Feasibility

Risk Mechanism with the Main Focus on Delays in Construction

Similar to the cost overrun in construction (R35), delays in construction (R32) could be affected by risk factors controlled by the government, including delays in issuing permits (R8), delays in land acquisition (R28) and change orders. However, again, these types of delays are usually accompanied with time extensions and possible financial compensation by the government. Because the time extension from the government due to this risk is typically stipulated in the contract agreement, no considerable effects have resulted from these risk events.

However, when the delays are due to financial (R12 and R15), management (R33 and R37) and technical risks (R24 and R36) under the control of the investor (as shown in Figure 5) and may indicate incompetency in the investor, work should be sped up to compensate for the time loss to complete the project on schedule. From the value of risk index, this risk falls in the top-ranked risk events, but due to the consideration that investors are mostly in charge of this risk, it was ranked at the bottom of the list. It should be noted that the risks related to financing are of major concern because two risk events (R12 and R15) that play a role in the delays in construction also appear in the top-ranked list.

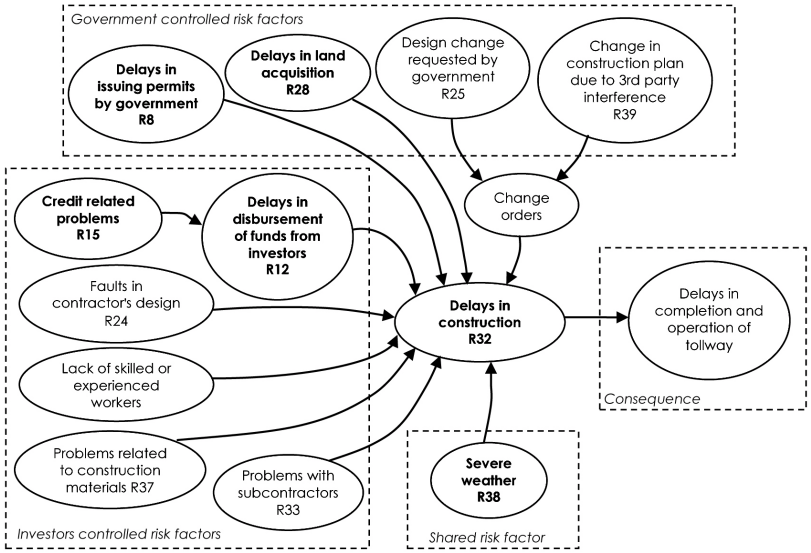

Figure 5. Risk Mechanism with the Main Focus on Delays in Construction

Severe weather conditions (R38) certainly influence the progress of construction work. Because this risk is not manageable by the investor or by the government, the consequences should be shared. The government can provide reasonable time extensions and the risk of financial losses due to unproductive days is borne by the investor.

With the above explanations of the mechanism of the top-ranked risk events, the allocation of risks can be summarised in Table 3 along with comparisons from other studies related to PPP projects. Although this study is limited to the perspective of investors in tollway construction and operation in Indonesia, the results are comparable with studies from other countries. Ten out of 18 risk events are judged as suitable to be shouldered by the government. One risk event, severe weather, should be shared between the government and the investor while the remainder are allocated to the investor.

Table 3. Comparison of Risk Allocation in PPPs with Other Literature Results

Risk Factor	Top Ranked Risk in this Study		Ke et al. (2010)	Roumboutsos and Anagnostopoulos (2008)	Li et al. (2005)	Cooper et al. (2005)	Grimsey and Lewis (2004)
	Covered Risk Events	Allocation					
Land acquisition or site availability	R28, R29, R30 & R31	G	G	G	G	G	I
Operational income	R40	I	I	I	I	I	I
Approval and permit by government	R7 & R8	G	G	G	G		
Government's reliability	R10, R27 & R43	G	G				G
Increment of toll fee	R42	G	G				
Availability of finance	R12 & R15	I	I		I	I	
Construction cost overrun	R35	I	I	I	I	I	I
Construction time completion	R32	I	I		I	I	I
Inflation rate	R20	I	S	N	I	I	S
Interest rate	R19	I	S	N	I	I	S
Weather	R38	S	S	N			

Note: G = Government, I = Investor, S = Share, N = Negotiation

CONCLUSION

The objective of this study was to assess and allocate the important risk events in PPPs for tollway construction and operation in Indonesia. The primary data for the study were gathered from a qualitative risk assessment survey. Interviews and discussions were also conducted to strengthen the findings.

Fifty-five risk events were assessed by the respondents using a 5-point Likert scale for the degrees of occurrence and impact. Based on the assessment, a R1 was estimated and used as a reference to classify the importance of the individual risk events. The top-ranked risk events were selected and allocated to the various project stages for analysis. The allocations to the project stage showed that 8 out of 18 risks are related to the land acquisition process, while 9 out of 18 risk events occur in the construction stage. This observation indicates the importance of the land acquisition stage (in addition to the construction process of a PPP project) from the perspective of the investors. The risk mechanism diagram developed by Niwa (1989) was adopted with modifications to explain the relationship and interaction between risk events and risk factors.

Land acquisition problems, which represent the major risks in the top-ranked risk event list, lie mainly under the control of the government. These risks trigger long delays and cost overruns. Cash available to investors also contributes to delays because investors are currently responsible for the cost of land acquisition. However, the degree is considered less significant than other factors that influence land acquisition. Investors should focus on the estimation of tollway volume in their financial calculations because this is a factor considered an investment risk and thus should be borne by the investors. Available information on road feeders planned to support the tollway should be prudently included because the road construction may not materialise. The tollway agreement should also clearly include a specific clause on procedures for toll fee increments and schedules. Reliance on available regulations may not provide a strong foundation if political issues are involved. Cost overruns in the construction stage, excluding change orders, are solely the responsibility of the investors. Inflation and interest rates should be also carefully considered in the cost estimation process. The project feasibility risk is mostly affected by factors within the scope of government control, particularly if the continuity of the project is challenged with prolonged land acquisition problems. Whatever the reason and the factor, the risk will lead to monetary and time losses for the investors. Investors should also focus on cash flow in financing the construction of the project because this problem may have significant effects on the completion of the project.

These findings are expected to be useful for the government as sources for review and upgrade of the regulations and practices of tollway investment risk management. The government should concentrate additional attention on reviewing the regulations and agreements that can ease the risks related to the land acquisition process so that additional private investors can be attracted to participate in infrastructure development. Acquisition of land for development by the government before offering the tender is one option that should be considered. These findings are also expected to provide the private sector with an extensive description of the challenges and opportunities inherent in the risk administration of investing in tollway projects in Indonesia.

Although this study was limited to the perspective of investors in Indonesia, the preferred allocation of risks is comparable to that of studies in other countries, which indicate that the findings may equally apply to the risk management of infrastructure sectors in other developing and developed nations. The relative importance of the risks may differ due to country-specific conditions and the maturity of the PPP market.

ACKNOWLEDGMENT

The authors appreciate the advice provided by PT. Citra Murni Semesta as the consultant of the project. This research project was funded by the Toll Road Regulatory Board (*Badan Pengatur Jalan Tol*), Ministry of Public Works, Republic of Indonesia in 2008.

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