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Smart surveyors for land and water management



Implementation of Performance-based Contract in Indonesia Construction

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Institut Teknologi Indonesia (ITI)



- **One of very few** technology university in Indonesia
- **Founded in 1984** by **Prof Habibie** (Indonesian Technology Top Figure; Indonesia **President No 3**) from **the Institutions of Engineers Indonesia (PII)** to **answer deficit** of Engineers in Indonesia
- **Student Body: 5,000** students in 10 study program including in Civil Engineering, Industrial Engineering, and Agricultural Engineering Programs
- **Around 10,000** Engineering **Graduates** since 1990

Indonesian Construction Experts Association (ATAKI)



- **The largest** Construction Experts Association in Indonesia
- **Founded in 1999** to answer **deficit** of certified construction experts in Indonesia and **equity with foreign** construction experts
- 34 provinces (**all Indonesia**) Branch Office
- **Members: 5,000** construction experts in Architecture, Civil, Environmental, and Mechanical Engineering
- **40,000** Construction experts **certification since 2005**



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CONTENTS



- Background, Objective, PBC in Brief
- Methodology
- Literature Review
- Discussion and Policy Implication
- Conclusion and Acknowledgement

BACKGROUND



- The main problem in road construction in Indonesia is **the age of the road that is very far below the age of the road plan**
- The government needed to incur **enormous maintenance and repair costs** if it used a traditional contract (Design-Bid-Build).
- Therefore, the Indonesian government implements a **Performance-Based Contract (PBC) as a solution** to the problem, with the hope that the risk of large maintenance and **repair costs will be borne** during the life of the plan **by the contractor** and **road conditions** can continue to be **in good condition** for the life of the plan.

OBJECTIVE



- → to discover the problems that arise in the implementation of PBC and tries to provide a solution.
- .

PERFORMANCE-BASED CONTRACT (PBC) IN CONSTRUCTION



- Is an outcome or performance-based contract approach where the project owner pays **the contractor's work in the form of fulfilling the performance indicators specified in the contract**
- **Focuses on the expected outcomes** of the work done (what), compared to **how the work is done** (how).
- **The contractor is responsible at certain times** to carry out the design, construction, and maintenance with a **performance-based payment system**
- Uses the **fixed price lump sum system and applies a bonus and penalty system** in the payment mechanism to the service provider
- It has the **potential to produce roads with better quality and service performance.**
- Service providers to **produce innovations** that can improve and guarantee quality for a long period of time and result in **better cost efficiency**

(Setiawan, 2019).

PERFORMANCE-BASED CONTRACT (PBC) IN CONSTRUCTION



- Has potential advantages over traditional approaches, such as: (Hendrawan, 2012)
 1. **Cost savings** in managing and maintaining road assets
 2. Contractors have the **space to innovate** competitively and responsibly
 3. **Certainty of financing needs and certainty of long-term financing.**
The nature of the contract is multi-year and the risk is calculated. Risks resulting from contractor decisions are the responsibility of the contractor
 4. Management of road organizers has become **more effective** and staff needs have been **streamlined. Institutional capacity will increase.**
 5. **Increased satisfaction of road users** because of the guaranteed achievement of the level of road services during the contract period.

METHODOLOGY



- This study is a **literature study** on PBC and its implementation in Indonesia which is descriptive in nature so that it can be analysed and concluded the problems and solutions **so that PBC contracts can be better implemented in Indonesia**

RESEARCH FINDINGS



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IMPLEMENTATION OF PBC IN INDONESIA



- The Directorate General of Highways as the road manager in Indonesia in the implementation of road maintenance projects has been using the self-management system and the contract system with **the Design-Bid-Build (DBB) delivery method.**
- **Routine maintenance** activities on national roads use a self-management system that is carried out with the quality and quantity of workers and equipment from the road manager which is not proportional to the length of the road that must be maintained every year.
- **Non-routine road maintenance** project activities such as upgrading and periodic maintenance are carried out using the contract system and the DBB delivery method.
- **Due to limited road maintenance budget, the handling for the 38,569.82 km national road network cannot be done as a whole and cannot be done every year.** The road manager has been prioritizing the handling of roads that have suffered the most damage first. While routine maintenance work is often delayed so that the decline in road conditions in the road segment is good and is being continuously increased.
- **Based on the above reasons, a solution is needed through the form of alternative contracts that are able to overcome various problems related to the performance and cost of handling national roads, the PBC.**

IMPLEMENTATION OF PBC IN INDONESIA

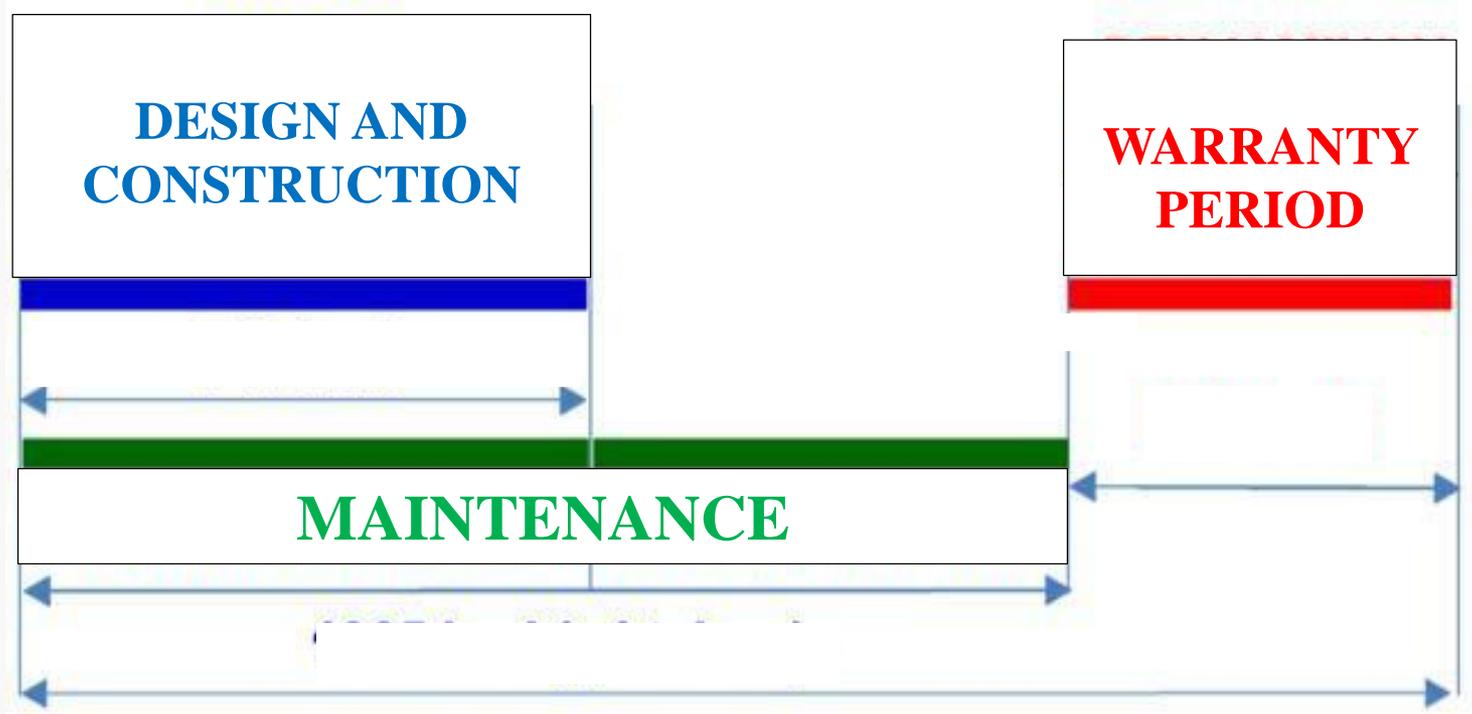


Figure 1 Typical Scheme of Scope of Work of PBC in Indonesia (Hendrawan, 2019)

IMPLEMENTATION OF PBC IN INDONESIA



- PBC in Indonesia is applied not only to project maintenance but also accompanied by improvements to national roads. The reason is that in addition to the sizable project value it is expected to attract the interest of contractors, but also as an effort to reduce uncertainty in the implementation of the PBC assuming that the contractor is the designer and builder of the work.
- It is similar to the Output and Performance based Road Contracts (OPRC) system compiled by the World Bank that provides a reference for the PBC which includes work: reconstruction (improvement) and road maintenance.
- OPRC provides a limitation that if the reconstruction work reaches 40-50% greater than the contract value, it will cause too high risk to the contractor; thus, if it refers to the OPRC, the traditional contract (DBB) is the right solution for such job compared to the PBC.
- In contrast, in such condition in Indonesia practices, the contract used is PBC, not the traditional contract as recommended by the World Bank OPRC system.

IMPLEMENTATION OF PBC IN INDONESIA



- For example, road projects in the northern coast of Java in Indonesia that connect the western side with the east side of the island. The facts show that from year to year, road conditions in Pantura are always damaged, including the road section of Ciasem-Pamanukan.
- The cause of damage is caused by an unstable base layer (clay with elastic properties). Other causes are due to rainwater inundation, vehicle load that exceeds load capacity of the road, and the volume of vehicles reaching 45,000 vehicles per day. With this existing condition, the use of PBC, instead of traditional contract DBB, is expected to overcome this problem.
- The contract value for the road improvement and maintenance works on the Ciasem-Pamanukan road section, from the total contract value of Rp. 97,406,765,972.24, allocating costs of Rp. 73,849,285,413.34 for improvement works (reconstruction), and for road maintenance works Rp.21,061,380,558.90.
- The proportion of the contract value for road improvement works that is greater than 50% compared to the contract value for maintenance activities that results in the contractor being exposed to high risk, a condition that should use the traditional contract DBB according to the World Bank OPRC system.
- Experience shows that the application of PBC has many obstacles caused by risk factors and risk allocation problem. As the result, the number of disputes between owners and contractors is high, and PBC contracts are less attractive to contractors. Researches on this matter suggests the need for an optimal allocation mechanism among parties who contract for the PBC in Indonesia that will be discussed further below.

FINDING AND DISCUSSION



- **Research found that PBC in Indonesia uses the Design-Build-Maintenance (DBM) delivery method**, and thus the contractor is the party that not only carries out the design, build (road improvement stage) but also carries out maintenance; the contract pricing is with a fixed price lump sum payment mechanism for the design and build stages, and a payment mechanism with performance indicator achievements for the maintenance stage. **As the result, the contractor is burdened by many risks, so that the contractor will suffer losses due to the risk.**
- This condition needs to be evaluated and corrected so that risk is allocated to the party who is best able to manage it. It is discovered that **there are three main problems that must be addressed so that the PBC is successfully implemented in Indonesia. The three problems are overloading vehicles, quality of existing roads, and the Ministry of Finance's reluctance to implement multi-year maintenance contracts** (Wirahadikusumah et al., 2015).
- **The challenges in implementing PBC in developing countries generally do not originate from the PBC concept but originate from other factors which include: related to government support, provision of funds, political influence and corruption, and lack of understanding of the PBC. The implementation of the PBC in Indonesia also encountered the same obstacles as the experiences of other developing countries.**
- **Pilot projects in Indonesia have shown difficulties with this type of contract.**
 - Firstly, contractors in Indonesia do not yet have the capacity (both technical and financial) to accept high risks. The level of uncertainty in Indonesia is greater, this is because of the high political influence at the regional and national levels, and weak law enforcement. Thus, there must be a more effective way to manage risk. (Wirahadikusumah et al., 2015). Transferring the risk to the contractor, especially risks that cannot be predicted by the contractor, will actually make the contractor trade off in terms of costs to bear the risk. For example, risks such as: very varied conditions of the existing road network and especially the case of overloading will certainly greatly affect maintenance costs. If the owner, in this case the road manager, is reluctant to share the risk, it will certainly not result in the achievement of the PBC implementation.
 - Secondly, with a fixed price lump sum payment mechanism, it prohibits any contract price adjustments. This is clearly burdensome for the contractor especially with a long contract period.

FINDING AND DISCUSSION



- The risk or uncertainty can be controlled and anticipated as early as possible, namely by managing risk. Implementation of construction projects is generally carried out in conditions with varying degrees of risk and uncertainty. These conditions can be categorized as "known", "known-unknown", and conditions "unknown - unknown" (Smith et al., 2006).
- The construction business is a business with high risks, risks such as: financial, political, security and risk when the implementation itself must be managed and handled properly by the contractor.
- While from the project owner side, starting from the decision making in the design stage to the stage where the physical building is operated, the project owner is faced with uncertain conditions regarding the final results of the project. Right on time, right on cost and as expected are the three risk events that exist in every project and certainly have an impact on the behavior of the project owner. Risk is defined as an event that is uncertain, but if the event occurs it will cause cost overruns (Thompson and Perry, 1992).

FINDING AND DISCUSSION



- In general, the project owner usually prefers to impose risk on the contractor, but as a result of the "necessity" of bearing a lot of risk, the contractor will "trade off" the bid price as a consequence of accepting risks that are beyond the control of the contractor (Khazaeni et al., 2012). Thus, the costs to bear the risk will again be borne by the owner. **An effort to manage well which party best bears the risk (the risk allocation process) significantly impacts the efficient and cost effective construction projects** (Levit e. al., 1980).
- **The basic principle of risk allocation is to impose risk on those who are able to manage the risk.** The study of risk allocation has been widely studied by several researchers. In carrying out the process of risk allocation there are two approaches namely a qualitative approach and a quantitative approach in the form of a risk allocation model (Khazaeni et al., 2012).
- **Some researchers develop quantitative models for allocating risk**, such as:
 - fuzzy logic (Lam et al., 2007; Xu et al., 2010); or
 - artificial neural networks (Jin, 2011).
 - Specifically (Barnes, 1983) has developed an algorithm to allocate risk based on risk measurement based on the standard deviation of the probability distribution. Barnes believes that if these risks are categorized as dominant risks and are outside the control of the contractor, then those risks must be allocated to the owner.

FINDING AND DISCUSSION



- PBC for a road maintenance project must be based on optimal risk allocation between contracting parties; **risks should be held by parties who:**
 - a) are able to assess, control and manage risks;
 - b) has the best access to hedging instruments,
 - c) has the greatest ability to diversify risk,
 - d) bears risk at a low cost(Wibowo and Mohamed, 2010)
- **Policy Implication:**
 - The implementation of PBC contract in Indonesia should be adjusted to better risk allocation practices so that the problems occurred will be minimized.
 - Countries with similar problem may use this proposed solution to overcome their problem in implementing PBC to their road construction projects.

CONCLUSION



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CONCLUSION



- The Indonesian government has problems in building and maintaining national roads with traditional Design-Bid-Build contracts, and trying with PBC contracts as a solution.
- In the implementation of the PBC system that does not follow the World Bank OPRC system, so that there are several problems.
- Problems that arise mainly due to the allocation of risk that is too large for Indonesian contractor who bear risks beyond their control, such as overloading of passing vehicles and the use of lump sum contracts. As the result, the number of disputes between owners and contractors is high, and PBC contracts are less attractive to contractors.
- From the literature studies, it was found that risk allocation should be to those who are more able to control risk. This should be the solution for the implementation problem of PBC contracts in Indonesia.
- For example, the Indonesian government is more appropriate to take the risk of overloading passing vehicles because the government through its institutions and regulations can control that risk. Another example is the type of fixed price lump sum contract that provides risk to the contractor; other alternative contracts such as the unit price contract or cost-plus fee contract should be explored so that the risk to the contractor can be more in line with his ability.
- Countries with similar problem may use this possible solution to overcome their problem in implementing PBC to their road construction projects.

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