

# Risk Management Analysis Based on Supply Chain Business Process for Public Private Partnership Public Housing

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**Abstract-** Covid19 Pandemic has made many countries like Indonesia spent their budget heavily on health and economy recoveries, meaning that some allocated budget including for infrastructure has been cut. In contrast, number of backlogs which determine numbers of people that need shelters are still remain high especially for low income groups (LIG). To tackle the problem, government has an initiative to engage private sectors through public private partnership (PPP) in public housing. The process is quite complex and has taken so many stakeholders like government, private sectors, consultants, contractors, vendors, subcontractors and financial institutions like banks and insurance companies. The complexities in PPP business models which involving so many stakeholders can create potential risks. Therefore, besides calculating investment return in the feasibility study stage, it is also important to make a risk management analysis based on supply chain business process. The supply chain business process must start from mapping business process, i.e. planning stage, contract award stage, implementation and the phase of hand over the facilities once the concessional period would end, transfer the ownership back from private sectors to government. This study has an objective to conduct literature study about risk management analysis by using ISO 31000: 2018, the relative new concept in risk management that replaces the same standard but from year of 2009. The model then will be combined with supply chain business process so risk management can be mitigated in each business process. The model of the study use supply chain business process in establishing the context in risk analysis followed by risk identification, risk analysis, risk evaluation with the integrated process of communication and consultation, recording and reporting as well as reviewing and monitoring. Study has found that there are critical risks that must be mitigated namely design risk, land price risk, legal land status risk, political risk, contractual risk, market risk, business risk, material price risk, operational risk, legal risk in hand over and asset impairment risk. The model has proposed several new techniques to mitigate risk namely using value at risk (VaR) by monte carlo simulation to measure market risk, business risk and operational risk, developing digitalization for the process in communication & communication, recording & reporting as well reviewing & monitoring. It is also recommended the using of supply chain financing to vendors and subcontractors as Banks have the accessed data from

**digitalization that consider government and private sectors' guarantees.**

**Keywords;** ISO 31000:2018, Supply chain business process, Risk management, Value at risk, Private sectors, Public private partnership, Public housing

## 1. INTRODUCTION

In 2<sup>nd</sup> Quarter 2020, Indonesia had a negative growth by -5,32 % with the prediction that in q3 the growth will be -2%, it will possibly go into the recession. Economy growth is used to be about 5 % on average, higher than the world economy which grew by 2 % previously and IMF predicted that the growth would be -4,9% in 2020 due to Covid19 Pandemic. Government national budget right now is 2,739 trillion IDR (189 billion USD). From this budget almost 25 % will be used for health and economy recovery with the amount of 695 trillion IDR (47 billion USD). Besides social, health and education, government would spend 419 trillion (29 billion USD) for building infrastructure and so-far 25 trillion IDR (1,7 billion USD) has reallocated for Covid19 treatment.

This phenomenon has made infrastructure budget cut and became less priority. At the same time, problem occurred as Indonesia still faces housing backlog of 7,64 million units especially for Low Income Groups (LIG). Government has tried currently to offer private investors about 6 housing projects in Palembang, Pontianak, Bekasi and Bandung. The number is still counted in the feasibility studies as the projects is still on inception stage. The scheme is well known as Public Private Partnership (PPP) with Build Operate Transfer (BOT) business model. Supply Chain Management will be complex in this process as it will involve many actors like government, project sponsor, contractors, consultants, sub-contractors, suppliers and financial institutions like banks and investors. The period also will be long term with the risk transfer from government to private sectors. Theoretical gap will occur from the concept of supply chain management and risk management. The projects entail supply chain process from consultant that makes the calculation of feasibility study, government that make a tender and gives the concession to third party through tender or beauty contest and private sectors including contractors, suppliers, vendors and operators that will build, operate, maintain until transfer back the project to government. This will perceive high credit risk to financial institution like banks as risk can occur from the

miscalculation from consultant, lack of guarantees from government as well as business and operational risk that private sectors will create during BOT.

Therefore, risk management by using supply chain analysis with understanding business process is important and would be the objective of this study. Consultants that conduct feasibility study must design not only capital budgeting analysis like calculating discounted cash flow like NPV, IRR and payback period, they also have to consider risk management analysis in order to minimize potential risk that can occur during the projects. So, government, private sectors and financial institutions can understand, mitigate and minimize the risk and make the projects successful and more feasible in the future.

## 2. LITERATURE REVIEW

The role of PPP as a risk sharing concept between government and private sectors have been discussed by [1, 6], [2], [4], [15] as well as [10]. As the government has limited budget and from value for money analysis, private sectors have advantage in build and operate/manage the facilities due to their expertise that is more productive and cost-efficient. Through Build Operate Transfer (BOT) business model, business risk, operational and financial risks are transferred from government to private sectors however private sectors expected that government still liable to manage or retain legal risk, political risk and social risk. Therefore, [7] argued that government is still critical as government can issue policy and regulations including licence, PPP contract, political will, guarantees as well as support like subsidy and incentive. Meanwhile, [8] discussed about the risks that can be occurred for private sectors such as operational risk, financial risk and business risk. The successful example in PPP for Public in India and Ghana. There is a clear-cut implementation of risk sharing practice as [14] exposed that private sectors responsibilities have covered construction, sales dan operation generation, property maintenance while government has taken in charge of permit and regulation issuance as well as land acquisition. In Ghana, government has issued guarantees from location legal status certainty, permit and regulation as well as subsidy as studied by [12].

Risk Analysis in PPP also analysed by [11], [13] and [2]. Every risk must be identified in advance, measured by severity and probability, analysed from risk mapping to treat the risk effectively. The most common methods in those studies used Analytical Hierarchy Process (AHP). The other method that used in financial institutions is calculating Value at Risk (VaR) which maximum probable loss can be counted from the concept of volatility and also can capture risk probability by using monte carlo simulation as suggested by [5]. VaR has a strong platform and has widely accepted in banking and finance industry especially for measuring market risk, financial risk and operational risk. As financial institutions give project finance in the supply chain business process for PPP public housing project and they already implemented Var, private sectors also can use VaR in order to calculate risks in PPP project. Measuring maximum probable loss with probability that comes from monte carlo simulation.

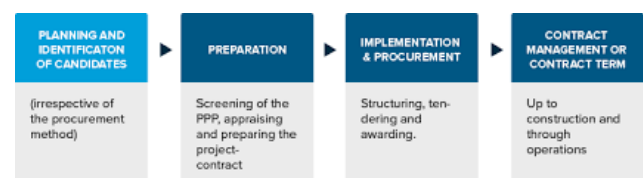
## 3. METHODOLOGY

Based on background that captures phenomenon and literature study that discussed about risk management in PPP for public housing projects, the study has an objective to develop the risk management analysis model for PPP in public housing. The risk management analysis will be made based on ISO 31000:2018 Risk Management Standard that has the element of leadership and commitment, value added and value protection as well as risk management process.

Risk Management Process starts from establishing the context, identifying risk, analysing risk, evaluating risk. As supply chain of PPP for public housing involves many stakeholders like government, consultant, private sectors, creditors, contractors, vendors and subcontractors, this study also will review literately the supply value chain from the business process of public housing for low income groups (LIG) and then used the model for establishing the context as guided in ISO 31000:2018. Therefore, the methodology of this paper has used literature studies from journals, references and related sources that discussed about risk management analysis based on supply chain in PPP for public housing.

## 4. RESULT AND DISCUSSION

PPP for public housing also must consider risk analysis based on supply chain management. In PPP for public housing, there are complex ecosystem that not only cover both government and private sectors but also customers as a main driver that drives revenue which will determine the level of investment's profitability, then financial institutions whom they will conduct project finance as main sources of financing in PPP as well as the appointment of vendors and sub-contractors as well as consultants as a part of operational activities. Those complex actors that have involvement in PPP will create risk. Risk is a chance that the unexpected event can cause a loss to the project, it may affect and causing disruptions, business failure and even loss to the projects. Therefore, in PPP, risk analysis must be managed properly and being analysed in advance before the project is constructed, commissioned and operated

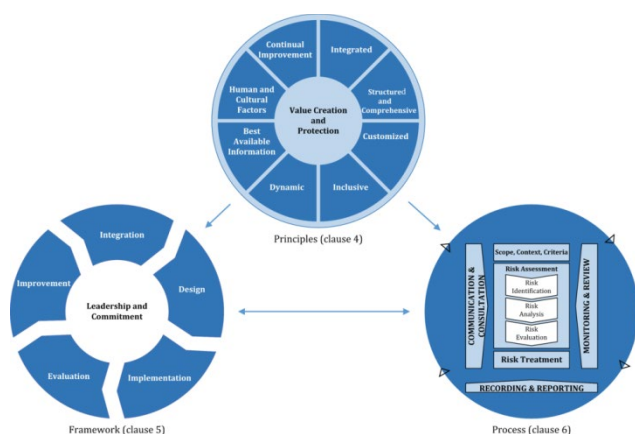


Picture 4.1 PPP Business Process

Source: PPP Certification Guide, 2020

In PPP, the main supply chain process has started from making a planning and identification of the projects, government assigned consultants to develop some materials like basic design; detailed engineering design; feasibility study; business case and tender documents. After that government will conduct a bidding or tender to select the private sector which will have the concession to build, to operate and to transfer back (BOT) the facilities to government when the concession period is ended. In the bidding or tender, preparation stage is critical; the project

must be screened and appraised including market potential and legal status of land area as the numbers must be agreed in the project contract. The following stages will be the implementation and procurement stage which discussing about project structure, tender and awarding. If the winner of contract is already awarded then project management must be evaluated on regular basis for instance annually to evaluate the progress of construction and also operations including the level of delivered public service including service quality, operation and maintenance including mechanical & electrical as well as facilities productivity and reliability. All stages will expose to risks and it needs a risk management analysis in each stage with comprehensive and integrated treatment. One of the possible solutions is by implementing ISO 31000.

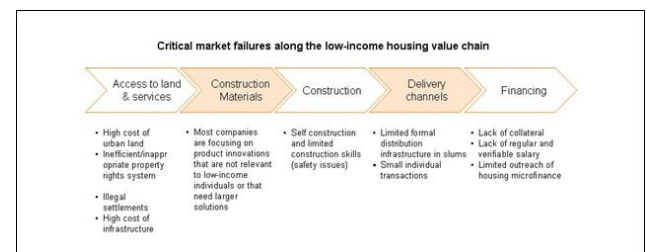


**Picture 4.2.** ISO 31000 Risk Management Guidelines

Source: ISO 31000, 2018

There are three points that should be embedded in ISO 31000 for Risk Management Analysis. Firstly, the leadership and commitment from both Government and Private Sectors that should be included in the process of design; implementation; evaluation; improvement and also the besides simply rely on government. Both parties should create synergies in PPP. Secondly; preserving risk management principles on PPP project that must develop value creation and protection with principles: structured and comprehensive; customized; inclusive; dynamic; depends on best available information; consider human and cultural factors and also practicing continuous improvement in risk management analysis. Thirdly, the process of risk management must start from defining scope, context and criteria and following risk assessment guidance from identifying risk, measuring and analysing risk, evaluating risk after that treating the risk according to severity and probability. In the process of risk management; three important things must be provided alongside the risk management process: consultation and communication; monitoring & review as well as recording & reporting. So, if ISO 31000 2018 is used in risk management for PPP project, private sectors must routinely consult and communicate risk analysis to government, have a set of clear and routine mechanism for generating monitoring and risk review as well as all risk management analysis process must be recorded and make

reporting. Risk management analysis can not only be done in initial phase when private sectors and government have set up feasibility studies including risk analysis or sensitivity analysis, risk management analysis must be sequential and always follows the supply chain process of PPP project. It is advisable that the mechanism follows banking sector in which banks regularly submit monthly banking risk report to financial service authority or just like go-public companies submit quarter report to stock exchange regulatory bodies. So, every risk and its risk analysis can be consulted, communicated, reviewed, monitored, recorded as well as reported from private sectors to government. This will be minimized risk, fraud, errors and potential loss as the mechanism works well between private sectors and government.



**Picture 4.3.** Supply Value Chain on PPP Public Housing for Low Income Groups (LIG)

Source: Global Urban Development, 2008

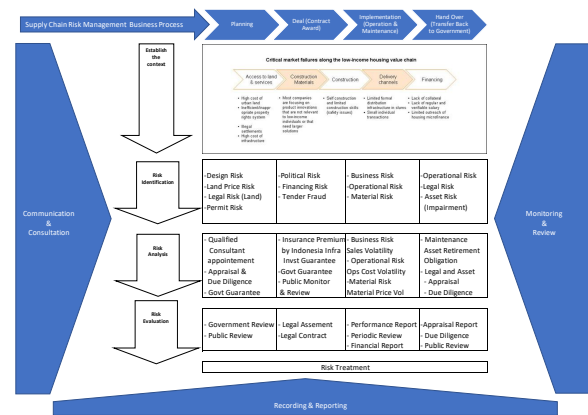
For public housing that will be provided for Low Income Groups (LIG) the value chain has started for the access to land and services; construction materials; delivery channels and project finance. Some risks have been identified. In land access, there is market risk, urban land price will increase rapidly and costly for LIG; property rights: some of the lands cannot be freely buy and sell due to government ownership, this makes public only can rent the property and cannot use the land later on as collaterals; infrastructure including permit cost and property taxes are also high in urban area. Construction material also has risk like material price due to the specifications that not really affordable for LIG, therefore the project must use substitute products that brings efficiency but the quality is still very good. Delivery channels to market perceived business risks whereby private sectors have limited access in formal distribution on sales and marketing; small individual transactions also will be occurred as LIG not prioritize their needs to buy property, they have food and mobility as well as retail consumptions as their priority in spending their income. Last one, risk in financing: most of LIG are non-bankable people who do not have a collateral as well as proof of income as most of them works at informal sectors with low record, low practice of good corporate governance and even with low or underpaid salaries/wages. These mentioned items can be used as perils (cause of risk) in risk management analysis.

Supply chain risk management risk management business process can be generated starting from the planning, deal (contract award), implementation (construction, operation and maintenance) until concession period has ended and transfer back to government following BOT scheme in each process it will combined with ISO 31000:2018 risk management process

from establish the context, identify risk, analyse risk, evaluate risk and treat risk with overall mechanism of communication and consultation, recording and reporting as well as monitoring and review.

In establishing the context, there are critical risk for PPP in public housing value chain with the factors such as: access to land and services; construction materials; construction during operational/implementation stage; delivery channels and source of financing. Those factors are the perils that can cause risk. Hence in the risk identification based on business process and perils in value chain, there are risks of:

1. Planning stage, the identified risks are: design risk (consultant's failures); land price risk; legal risk from land status and permit risk. Those risks are more liable to government responsibility. The mitigation can be conducted by appointing qualified consultant, due diligence and government guarantee in issuing permit including certainty in land legal status.
2. Deal (Contract Award) stage, the identified risks are: political risk (leadership change and political will); financing risk from creditor like banks and tender fraud. These risks also are government responsibility. Those can be mitigated by political insurance premium, government guarantee and independent public monitoring and review.
3. Implementation (Construction, Operation and Maintenance), the risks are: business risk (sales); Operational Risk; Material Risk. In this stage, the risks already transfer from government to private sector. Private sectors must manage all actors including vendors and subcontractors. The mitigation can be done by diversifying sources of income and subsidy with government
4. Hand Over stage with the risks like operational risk and asset impairment risk which needs asset retirement obligation to be records as private sectors' liability, due diligence and independent appraisal to have certainty that the asset can work properly and still can be monetize or able to generate into revenue stream



Source: Author Analysis

There are some business innovations that can be implemented as risk mitigation programs. Firstly, digitalization of the overall process from recording and reporting, consultation and communication as well as monitoring and review, the database can be analytical and shared between government and private sectors. Digitalization also make the process of overall risk management analysis become easier for all stakeholders. Secondly, connection from government guarantee and support that links to private sectors and banks. So, Banks can give lending and financial support vendors and subcontractors with supply chain financing by seeing the private sector commitment and government guarantee. This will enable private sectors to avoid over-levered and minimize chance of default by implementing risk sharing agreement with vendors and subcontractors. Thirdly, private sectors can run monte-carlo simulation to measure probability and magnitude of business risk, operational risk and market risk by using Value at Risk that can capture volatility, exposure and time. VaR would be able to measure the maximum probable loss for private sectors as volatility from business risk, market risk and operational risk is getting higher, so private sectors can manage the risk and asking for government support like subsidy, revenue diversification permit, efficiency program or sales/market guarantee with reasonable arguments by using VaR from Monte Carlo Simulation. Those innovations can be implemented by conducting risk management process in ISO 31000:2018 combines with supply chain management in business process of PPP Public Housing. Risk mitigation can use several techniques like risk retention (low probability-low severity); risk control (high probability, low severity); risk transfer (low probability-high severity) and risk avoidance/risk prioritization (high probability-high severity). Then the mitigation can be easily evaluated through risk mapping to track the progress risk mitigation techniques works, transforming inherent risk (pre-mitigation actions) into residual risk (post-mitigation actions)

## 5. CONCLUSION

As national budget is focused for Covid19 treatment including economy recovery, countries like Indonesia has to develop infrastructure with scheme of PPP including housing project. Supply chain management process will

take long times and it involves several stakeholders from government to private sectors, financial institutions like bank and insurance, vendors, subcontractors and customers. Risk can occur during the stages starting from planning; awarding the contract; implementing the project and handing over the project back to government when concession period is ended.

Therefore, risk management analysis based on ISO 31000:2018 which is considered quite comprehensive with considering leadership & commitment; value added & value protection principles as well as risk management process can be used to mitigate the risks in the PPP for public housing. Supply chain business process has used in establishing the context as a first step in risk management. Based on that mapping, then it can continue to further stage like risk identification; risk analysis; risk analysis and risk evaluation as risk treatment process. From the model analysis, there are some critical risks that should be critically mitigated like design risk, legal risk, permit risk, land acquisition price risk, political risk, financing risk, business risk, operational risk, material price risk and asset impairment risk. There is should be a discussion which risk that should be handled by government and which risk that should be transferred from government to private sectors with several risk mitigation techniques like retention; controlling; risk retention and risk avoidance.

Before determining the risk mitigation techniques, it is advisable to calculate probability and severity of risk by using maximum probable loss via VaR concept with monte carlo simulation importantly to measure volatility in business risk, market risk and operational risk that significantly impact the business. The higher the volatility, the higher the risk so private sectors can negotiate with government for asking subsidy, securing sales, diversifying recurring revenue; increasing commercial spaces in property projects and/or extending concessional period to recover investment and creating profit. Digitalization in supply chain throughout overall business process also can make easier in credit decision like the implementation of supply chain financing from bank to vendors and subcontractors by seeing the guarantee from government and private sectors as main investors. Digitalization also makes it easier to implement the integrated sub-element in risk management process: consultation & communication; recording & reporting as well as reviewing & monitoring. Those process can be shared among stakeholders so risk management can be more productive and effective to mitigate and to minimize risk in advance in order to make the PPP Public Housing project become more successful. So, government can increase number of public housing projects, private investors can feel more attractive to engage in the project. Creditor also can conduct credit analysis easier and more effective in terms of cost-scope-time including gives a lending to vendors, contractors and subcontractors with the product scheme well known as supply chain financing.

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