

Investment Feasibility Study of the Public Housing Project through Public Private Partnership Scheme

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Abstract— The provision of public housing by the government has not been able to meet the housing needs, particularly affordable housing for low-income community/citizen. Collaboration between the government and private sector is needed in the form of public private partnership to increase the feasibility of public housing projects, especially in the investment/financial context. This study aims to evaluate investment feasibility of the public housing project that planned through the PPP scheme based on a case study in Bandung City of Indonesia. An engineering economy method was used in this study to calculate capital budgeting and the life cycle cost including the revenue based on the data, standards/regulations, and interview from the government and other institution related to public housing. Public housing project planning through the PPP scheme was developed for the provision of public apartments (35%) and commercial apartments/facilities (65%) that utilize government-owned land by rental. The Project can generate investment valuation with the Internal Rate of Return (IRR) of 13.18%, Net Present Value (NPV) of IDR 610,063,962, Payback Period for 7.45 years, and Debt-Service Coverage Ratio (DSCR) of 1.14. In general, the investment of public housing project through PPP scheme is feasible based on various indicators, but still requires development to improve investment attractiveness for the private sector.

Keywords— Investment feasibility; Public housing; Public private partnership.

I. INTRODUCTION

Housing is one of the basic needs for human livings [1]. Indonesia is facing demographic bonus nowadays and required more housing for their citizen [2]. Homeless household or backlog number increases. Based on data from the Government of Indonesia [3], the housing backlog reaches more than 7.64 million units. The provision of public housing is still cannot fulfill demand for the community's need, so that every year the backlog in the context of home ownership continues to grow in Indonesia. This indicates that many people still have difficulty to access formal housing, especially affordable/low cost or public housing. For this reason, the problem of providing the housing cannot only be handled by one actor, but because of its complexity, other roles are needed [4].

Public housing or low-income and affordable housing are a large portion of the housing programs in developed and less developed countries [5]. The provision of public housing for low income community/low income citizen is one of the government's responsibility. On the other hand, housing development is also related to the property and construction industries which are part of the private sector businesses. Nevertheless, private sector ignored the development public housing for low income families segment of the market because the yield was too low [6]. Public housing investment requires the funding of an investment pathway which capable to supplies and maintains capital assets and services over time [7]. Therefore, one alternative solution in the context of providing public housing can be through a public private partnership (PPP) scheme, because the private sector can bring efficiency/innovation and public financing, while the government facilitates land assets and other support in long-term contracts [8]. Indonesia state budget for infrastructure is limited [2]. The collaboration between the government and

private sector is one of the potentials that can be encouraged to answer housing challenges, especially related to limited land and funding as well as other factors. PPP can attract long-term investments and provide all the guarantees [9]. The interaction of government authorities and private companies will allow for the development and implementation of large-scale infrastructure investment and construction projects.

PPP is profitable in the context of higher efficiency in the sector private sector and because of the substantial costs involved in design, construction, and operation the project. Many projects in developing countries use PPP schemes [10]. Determining the reasonable profit rate of affordable housing developers is the key point to promote the investment and development of affordable housing [11]. Investment feasibility is a significant or critical success factor in the context of PPP projects, including public housing/apartment project [12 & 13]. The appraisal and selection of appropriate PPP projects is the first challenge encountered by the public sector in PPP project [14].

PPP Infrastructure projects contain unforeseen risks small and new will provide a return on investment within a period of time relatively long. Without being supported by an efficient financing system and offering incentives stimulating, it seems quite difficult for the government to invite the private sector to invest [15]. The main goal of housing companies is to maximize profits, while the main goal of public bodies is to protect public interests [16]. Previous studies demonstrated that one of the topmost obstacles to fulfil this desire on the project is financial risks [17]. Until now, housing projects built under the PPP scheme, which have been widely applied in other countries, have not yet been implemented for the provision of public housing in Indonesia [18]. Therefore, at the very beginning of housing investment, the project feasibility researches ought to be an indispensable phase,

which can correspondingly increase investment benefits and represent the interests of beneficiaries [19]

The planning/preparation process for infrastructure projects through PPP scheme in general still encounters many issues and challenges, such as deficiency of commitment from the government, the price/cost to be paid by the community is not affordable, and less profitable from the private sector or not feasible based on investment feasibility criteria, and so on. Capacity that needs to be increased in PPP project including requirements planning, securing and allocating funding feasible, and design and carry out the program [7].

Realization of investment programs of social housing is a complicated, multistage process, one of key stages of which is a selection of the most efficient projects with the framework of the program [20]. Investment analysis in the project selection process is an important factor in ensuring project success, especially in the real estate and construction industries [21]. Public housing investment programs through the PPP scheme is no different. Moreover, there are principles that need to guide the framework of cooperation: (1) the government can be successful in providing public infrastructure; (2) the private sector can earn adequate profits; and (3) the price paid by the community can be reasonable to access infrastructure services [22]. Failure to comply with any of the above principles can contribute to the vulnerability of PPP's success in the development of public infrastructure projects, in this case public housing.

The most popular stream of the PPP research in 2009–2019 was the promotion of PPP, while Risk management process, legal and procurement issues, and financing issues were ranked second, third and fourth places respectively [23]. Furthermore, considering the large capital investment and long-period of operation of PPP projects, scholars focused on three financial issues, including project cost, project revenue (e.g. price of the services or products, project profitability and government financial assistance) and capital structure. Based on various issues and the results of previous research, a study on the feasibility of investing in public housing projects for low-income community/low-income citizen through the PPP scheme is necessary as a reference in order to promote it to the private sector. Moreover, the critical success factors of PPP from each developing country are determined from their respective contextual issues [24]. Therefore, it is important to plan in detail a public housing projects with specific PPP schemes that conform with certain country regulatory frameworks and contextual condition as well as in line to the relevant findings from literatures to provide a more concrete concept for the public and private sector.

II. LITERATURE REVIEW

A. Public Housing Project under PPP Scheme

PPP is a cooperation concession in the long term (generally 25-50 years) between government agencies and private project-based entities that are given rights and obligations to finance, design, build, and operate/manage a facility with reference to specific performance standards contractually [25]. On the other hand, the government is obliged to determine the output specifications, such as the

number of units built, financial parameters, such as the maximum selling price, profit-sharing; and risk allocation [26]. The aim of the government in conducting government-business cooperation is to reduce the gap in the state budget in infrastructure development [27]. For business, the obvious advantages are the ability to implement long-term projects with government guarantees of profitability, reduced government pressure and creation of a good image [9]. Housing Projects under the PPP scheme will be offered to private parties so that financial viability is an significant issue. The project can still be implemented under a PPP scheme if it is attractive to the private sector through various support mechanisms [25].

Many of the projects in international settings and in developing countries utilize the public-private partnership [10]. There are, of course, disadvantages to this arrangement. One risk is that a reasonable profit may not be realized by the private corporation due to low usage of the facility during the operate phase. To prevent such problems, the original contract may provide for special subsidies and loans guaranteed by the government unit. The development of public-private partnerships in the infrastructure sectors is characterized by expanding partnership relations [9]. When a joint agreement is concluded, private companies can work on a long-term basis, implementing innovations, reducing the cost of investment and construction projects, and increasing the efficiency of infrastructure which is very important for government authorities. The private sector that invests in affordable housing should not passively wait for subsidies and preferential policies and measures of the government; instead, they should actively innovate in the profit model of affordable housing and promote the construction of affordable housing [11].

Government facilitation in partially or completely funding for licensing and land provision is important given the high risks associated with business and regulations in PPP implementation [28]. In case of unsatisfactory indicators of commercial efficiency, the private partner will not be interested in the project, so that the government should increase its share of the investment burden, reducing the burden on private companies [9]. In order to reduce the housing backlog, the solution that can be taken is to eliminate the restrictions on housing development by the private sector and the government through simplification of regulations [29]. The critical success factors of the PPP project, comprises project funding, land acquisition resolution, financial system development, and provision of incentives [12].

Furthermore, granting rights to the private sector to develop business/commercials in line with the development of major infrastructure in collaboration at the project site is one way to increase the attractiveness and feasibility of PPP for investors [28]. The Government require to consider providing free land for affordable housing to ensure the capabilities and benefits of commercial sector partners [30]. Wardhana [31] in his research discusses the Game Theory method to determine the comparison between subsidized/public and commercial units, with the finding that the optimal strategy is obtained

with the percentage of subsidized units of 32% compared to commercial unit.

Development of public apartment that built on the government land needs adequate support in accordance with the target occupants, unit area, rates, and facilities. The facilities provided are very dependent on land area and number of residential towers built [32]. Public housing shall be developed with mixed building concept to generate additional streams of recurring revenues [33]. The average land area required by developers in building public apartment with the concept of Mixed Use is 15,990 m² [34]. Regarding the type of residential tenure, several studies have found that public apartments unit that can be purchased and owned are more attractive for the citizen/community than the rental types [35 & 36].

B. Project Investment Feasibility

The key factor for the successful implementation of the PPP scheme is the feasibility of the project investment which is assessed through the value of money and optimal benefits for stakeholders [22]. Financial feasibility needs to be clearly analyzed before the implementation of project transactions (PPP) commences [2]. A financial feasibility analysis determines the financial viability and profitability of a project [37]. The investment analysis model uses the engineering economy method which is a science oriented to the calculation of the economic values contained in an engineering activity plan [38].

The engineering economy study involves computing a specific economic measure of worth for estimated cash flows over a specific period of time [10]. The economic values used in evaluating the feasibility of project investment are the internal rate of return (IRR), Net Present Value (NPV), and payback period (PbP) [39]. Basically all evaluation method investments are consistent with each other, meaning that if evaluated by the NPV method and other methods can produce the same recommendations, however specific information result will be different [40]. Therefore, in practice each the methods are often used together in order to get an overview a more comprehensive approach to investment behavior.

PPP implementation in Indonesia accomodates some financial factors like capex, opex and business risk into financial model projections which result in IRR [33]. The IRR method is a method for calculating the rate of interest (discount rate) that makes up the present value of all expected cash inflows equal to the present value of the expected cash outflows [41]. In principle, IRR is a series of calculations that make the present worth of a cashflow equal to zero [10]. Several related calculations before calculating the IRR include the value of the weighted average cost of capital (WACC) as a reference for IRR-based feasibility indicators. WACC is a combination of debt-equity financing. The concept of WACC is that each component of a capital structure has a cost, and is the average sum of all these costs taking into account the proportion of components in the structure capital [42]. WACC is calculated by determining / calculating in advance the cost of debt and cost of equity [10]. Cost of debt (CoD) is calculated by multiplying the interest rate of the lender bank

with the applicable tax, while cost of equity (CoE) is calculated by adding up the percentage of risk free rate, beta, equity risk premium, country risk premium, and specific risk.

How to calculate the IRR value are as follows: 1) Calculate the net cash flow over the life of the project, plus the salvage value of the assets (if any); 2) Determine the comparative interest rate that is greater than the rate of return, the difference should not be greater than 5%; 3) Calculate the IRR value [43]. A project is said to be feasible if it has an IRR greater than the marginal rate of return (MARR) [10]. MARR is a reasonable rate of return established for the evaluation and selection of alternatives. The MARR value is generally determined subjectively through considerations certain of that investment. The considerations in question are: 1) investment interest rates; 2) other costs that must be incurred to get investment; and 3) investment risk factors [40].

Ndigha [21] in his case study in the context of the IRR value revealed that that the project can be accepted by a certain private sector in the real estate/construction industry if it produces an IRR of 20%. Furthermore, the case study of Rahadi et al., [44] regarding the feasibility analysis of premium apartments found that the range of the feasibility of the investment that can be generated, namely the IRR of 12.45%-27.53%. Sumirat et al. [33] found that average IRR for property and construction industry in Indonesia from historical data of 2009-2018 approximately 13,77%, with with minimum of 10 % and maximum was 19 %. On the other hand, Hadiriyadi [34] found that minimum profit and expected profit from the public housing investment is between 15% and 19.50%.

The NPV method basically moves the cash flow that spreads over the life of the investment to the initial investment time ($t = 0$) or the present condition, by applying the concept time value of money [40]. The NPV criteria according to Bas (2013) is that if the NPV is positive ($NPV > 0$) then it means that the project is declared feasible, while if the NPV is negative, it means that the project is not feasible. Rahadi et al. [44] in his case study related to the feasibility analysis of premium apartments found that the acceptable NPV range was IDR 64,958,850,071-541,304,682,264. On the other hand, Ndigha [21] in his case study reveals that the amount of NPV that can be received by a private sector in the real estate/construction industry is at least 10% of the initial investment cost.

Payback Period (PbP) is the number of years or duration required for an investment to cover the initial investment or when NPV equal to zero [10]. PbP analysis basically aims to find out how long (period) the investment will be able to be returned when the break-even point occurs [40]. In this PbP method, the investment plan is said to be feasible if the PbP is less than the concession period ($PbP < n$) and vice versa. The general formula for calculating PbP is: Investment Cost/Annual Benefit. Infrastructure projects require long-term financing, which means long payback periods [45]. Rahadi et al. [44] in his case study found that the acceptable payback period range is around 6-9 years. Ndigha [21] in his case study in the context of the payback period reveals that a project can

be accepted by a real estate sector if the payback period is < 10 years.

Projects with payback periods of up to 5-7 years or 10 years are attractive for the private partner in the construction industry [9]. At the same time, for the government, the payback period for projects of high social significance can be more than 30 years. The ratio of funds from the government and the private partner ranges from 45%/55% - 20%/80%. At the same time, projects differ by the volume of investment, indicators of economic efficiency, implementation time, etc. Thus, the task of determining the economically sound distribution of the investment burden is very important. In cases where the IRR is lower than the WACC, the NPV is negative. It may happen that for some IRR values higher than the WACC and the NPV turns out to be positive, however with values that are not high enough to attract private capital [46].

Oprea [37] stated that financial feasibility presumes that both equity investors' and lenders' financial objectives will be met if the project goes forward. Lender objectives are that the project generates sufficient cash flow to permit repayment of interest and principal on the mortgage loan, and that the project's most probable selling price will be sufficient, in the event of default and foreclosure, to generate through a forced sale the cash necessary to retire the mortgage loan. One common measure of this ability are the debt-service coverage ratio (the relationship between the project's expected net operating income and the annual debt service obligation).

III. METHOD

A mixed approach was used in this study; qualitative with a case study to develop project needs/plan and structures of revenue/income and cost, while quantitative to evaluate investment feasibility using economy engineering method. The data collection method is based on a combination of project planning data and information, interviews with public housing authority officials, and a review of the relevant literature and government standards. This research is focused on the planning of public apartment project through PPP scheme in Bandung City of Indonesia, namely Paldam Public Apartment. The PPP project is the first initiated by the local government of Bandung City with the concept of public apartment which is built on land owned by the government through a PPP scheme with the concept of term public apartment ownership (not rented).

Public apartment and its facilities need to be planned in detail according to relevant data and standards as a basis to estimate the initial investment. Investment cost estimation is the process of predicting the total cost and price of the resources required for a given scope of investment in assets, activities or projects. The type of investment cost estimation used in this study is a conceptual estimate/cost basis of estimate, which is a cost estimate at the very early stage/concept and before the building is designed with the purpose of a feasibility study and with the building area factor method (m²) and/or parametric model [47]. The results of the planning are evaluated for investment feasibility using the

economy engineering method, especially based on investment eligibility criteria, namely internal rate of return (IRR), Net Present Value (NPV), and payback period (PbP). Calculation of investment feasibility based on the formula as in the literature review is using the Microsoft Excel software. The functions on a computer spreadsheet can greatly reduce the amount of hand work for equivalency computations. The Microsoft Excel functions can perform most of the fundamental engineering economy calculations [10].

IV. RESULTS AND DISCUSSIONS

A. Public Apartment Plan under The PPP Scheme

Based on information from informants and analysis of regulations and related literature, a public apartment project plan can be developed through the PPP scheme in this study. The form of return on investment of the PPP project is through a *user charge* (not availability payment/government payment). The PPP concession period planned for the Paldam Public Apartment for private sector is 50 years. The form of utilization of government assets in the form of state/regional owned land for public apartment development can only be done in the form of a lease in order to obtain a building ownership certificate exclusively for public apartment properties. Support/incentives from the government are needed to attract the private sector to invest in low-profitability infrastructure projects. This support shall include facilitation of permits, land preparation and maturation, including facilitation of the temporary/return occupancy process for affected residents. On the other hand, the Government can facilitate basic infrastructure development. The public apartment area has 35% of the total building area compared to commercial units area (65%). This proportion has met the minimum regulatory requirements (20%) and adopted the research of Wardhana (2021) to achieve the optimal strategy. The composition of the commercial area is quite large as an incentive for the private sector, so it is expected to increase potential profit in developing affordable/low-cost housing projects through PPP scheme. Given that composition, the public apartment capacity is obtained as much as 450 units. According to the local government, this proportion has met the minimum needs for community based on the government housing program.

Furthermore, by referring to the spatial incentive from the local government for a land capacity of 16,000 m² with a building coverage ratio limit of 60% and floor area ratio 4.5 and the need for facilities/circulation in each building (20-30% of the area of a building), the land capacity that can be built is 9,600 m², with a total floor area of the building which was previously only 64,000 m², to a maximum of 72,000 m². By considering various technical and cost aspects, the total area of each building that can be built is as demonstrated in the Table I.

TABLE I. Planning of Unit and Area of Components for Construction of Public Apartment and Commercial Apartment/Facilities

No.	Buildings	Unit	Area (m ²)	Building Floor Area (m ²)	Proportion (m ²)
I.	Public Apartment (Owned): Type 1: 24 m ² Type 2: 33 m ²	150	2,500	19,320	34.2 %
		300			
II.	Public Facilities				
1)	Trading Facilities	30	200	300	0.53%
2)	Worship Facilities	1	200	500	0.89%
3)	Education Facilities	1	150	250	0.44%
III.	Commercial Apartment (Rent)	525	2,500	26,038	46.10%
IV.	Commercial/Business Facilities:				
1)	Shopping Center	130	2,500	10,075	17.84%
2)	Office	20			
			8,050	56,483	100%

The planning for the needs of the public apartment and its facilities is then calculated using the conceptual estimation method or cost basis estimate, according to the Association for Advancement of Cost Engineering (AACE) International Recommended Practice Number 46R-11 [47]. The conceptual/cost basis estimation is refer to the Ministry of Public Works and Housing Regulation Number 22 Year 2018 concerning Guidelines for the Construction of State Buildings (including for public housing).

According to the regulation, stipulates that the components of the cost of constructing state buildings include components of construction implementation costs and support costs in the form of technical planning costs, and construction supervision or construction management costs. Construction implementation costs consist of standard work costs and non-standard work costs. The total cost then becomes the main reference in determining the supporting cost components. The entire cost includes the cost of building permits/building approvals, construction overhead, insurance, inflation, and taxes in accordance with the related regulations.

The amount of construction implementation costs, especially standard work costs, is calculated based on the highest state building unit price standard (set by the local government) multiplied by the total building area. Based on the standard, the unit price/m² for physical construction of buildings in Bandung City of Indonesia is IDR 6,335,000, while the total area of the building within the scope of this PPP project is 56,482 m². Furthermore, there are non-standard costs involved in this construction work. The non-standard costs are costs used for the implementation of non-standard physical construction (for which there is no standard) which is calculated based on a percentage according to the regulation reference which is then multiplied by the standard construction cost.

TABLE II. Estimation of Initial Investment Cost of Public Apartment and Commercial Apartment/Facilities

Cost Description		Cost (IDR)
I. Standard Construction Cost		
Building Area 56,482 m ²	Standard Price/ m ² : IDR 6,335,000	357,816,637,500
II. Non-Standard Construction Cost		
A. Permission and Land Preparation		
1) Permits/Licenses (1%)	x I. Standard Construction Cost	3,578,166,375
2) Land Ripening (2%)		7,156,332,750
B. Infrastructure		
1) Waste water treatment plan (1%)	x I. Standard Construction Cost	3,578,166,375
2) Basic infrastructure and facilities (3%)		10,734,499,125
C. Other non standard components		
1) Deep foundation (5%)	x I. Standard Construction Cost	16,101,748,687
2) Utility connection (1%)		2,862,533,100
3) Furniture and AC (5%)		17,890,831,875
Total of Non-standard Construction Cost (A+B+C)		61,902,278,287
Total Physical Construction Cost (I. Standard + II. Non-Standard)		419,718,915,787
III. Supporting Costs/Project Management Fee		
Project preparation/construction planning costs (2,32%)		9,653,535,063
Construction management consultant fee (1,36%)		5,456,345,905
Contingency/management fees (2%)		6,295,783,736
Total of Project Management fee		21,405,664,705
Grand Total		IDR 441,124,580,492

The total investment cost of public apartment under the PPP scheme is then included in the funding allocation between government and private sector. The funding allocation is made according to the indications of support that can be provided by the government, among others, land preparation and maturation, infrastructure development, and support for permits/licenses.

TABLE III. Funding Allocation of The Investment of Public Housing Project through PPP Scheme

No.	Investment	Cost Estimation (IDR)	
		Government	Private Sector
A	Main Cost		
1	Planning and Design	-	9,653,535,063
2	Construction Management	-	5,456,345,905
3	Construction:		
a	Infrastructure	14,312,665,500	-
b	Public Apartment	-	137,555,734,135
c	Commercial Apartment	-	185,383,407,223
d	Commercial/ Business Facilities	-	71,732,609,804
B	Support Cost		
1	Land Preparation	8,456,832,750	-
2	Permits/Licenses:	1,431,266,550	2,146,899,825
3	Contingency Cost	-	6,295,783,737
	TOTAL	100,324,231,800	418,224,315,693

B. Investment Feasibility Evaluation

In this section, an analysis of the calculation of the components of income and costs has been carried out as well as the preparation of WACC and MARR. Subsequently, an analysis of cash flow calculations is implemented to evaluate the feasibility of investing in the of public apartment including Apartments/Commercial Facilities under the PPP scheme.

TABLE IV. Annual Incomes/Revenues Estimation of the Public Housing Project Investment through PPP Scheme

No	Properties	Unit	Area per Unit (m ²)	Prices (Houses)/ Monthly Rates (IDR)	Annual Incomes/Revenues (IDR)
I. Public Apartment Building					
1	Residential Sales Type 1	150	24	170,400,000	25,560,000,000
2	Residential Sales Type 2	300	33	234,300,000	70,290,000,000
3	Motorcycle Park	450	1.5	-	-
4	Car Park	30	11.5	200,000	72,000,000
5	Service Charge Type 1	150	24	240,000	432,000,000
6	Service Charge Type 2	300	33	330,000	1,188,000,000
					97,542,000,000
III. Public Facilities					
1	Trading Facilities	30	10	2,500,000	900,000,000
IV. Commercial Apartment Building					
1	Hotel	150	21	18,000,000	19,440,000,000
2	Apartment Rental Type 1 Bedroom	200	30	10,500,000	16,380,000,000
3	Apartment Rental Type 2 Bedrooms	175	36	12,960,000	17,690,400,000
4	Motorcycle Park	500	1.5	50,000	300,000,000
5	Car Park	200	11.5	250,000	600,000,000
					54,410,400,000
V. Commercial/Business Facilities Building					
V.A Shopping Center					
A.1	Big Store	20	80	32,000,000	5,376,000,000
A.2	Medium Store	40	50	20,000,000	7,200,000,000
A.3	Small Store	40	30	9,600,000	3,456,000,000
A.4	Food & Beverages	30	20	5,800,000	1,566,000,000
					17,598,000,000
V.B Offices					
B.1	Office Type 1	10	50	17,500,000	1,470,000,000
B.2	Office Type 2	10	80	28,000,000	2,352,000,000
					3,822,000,000
V.C Parking					
C.1	Motorcycle Park	200	1.5	42,000,000	504,000,000
C.2	Car Park	50	11.5	26,250,000	315,000,000
					819,000,000

In order to prepare cash flow, various elements of incomes/revenues and life cycle costs are identified. In the

incomes/revenues section, elements related to public apartment properties are the sale of residential units, service charge fees, rental of trading facilities and parking. On the other hand, there is income from rental of commercial apartments that can be used as serviced apartments or hotels, while for commercial facilities, there is income from shopping centers unit, offices unit, and supported by income from parking. The following table outlines the components of overall revenue.

The selling price for public apartment is set at Rp. 7,100,000/m² by considering the selling price limit as stipulated in the Minister of Public Works and Housing Decree Number 242/KPTS/M/2020 (max. IDR 7,300,000/m²). The total sales of Public Apartment is IDR 95,850,000,000. Based on regulations in Indonesia, for housing development on government-owned land, only public apartments units that can be purchased and owned by the citizen/community with proof of building ownership certificate (not including joint land ownership), while commercial apartment units can only be rented out so that it affects the amount of income/profit. However, the ownership of the public apartment is limited only to the ownership of the building during the land rental or PPP period (50-60 years), so after that period the land assets become the property of the government as before.

In the case of commercial apartment/facilities properties, the assumptions and prices/tariffs refers to data from Colliers [48] in the sector of serviced apartment, hotel section, retails, and offices. The occupancy assumption used is 60-65%, while the rate per day for the hotel is IDR 600,000 and a serviced apartment of IDR 350,000. On the other hand, for commercial facilities in the form of shopping centers/shops, the assumption of occupancy used is 70-75% with rental rates including a monthly service charge of IDR 290,000 - 400,000. For business facilities in the form of office units, the assumption is that the occupancy rate is 70% with the rental rate including the monthly service charge of IDR 350,000.

Furthermore, in order to project the cashflow, various components of the required annual costs are calculated (as in Table V). In general, these costs include electricity cost, water cost, management/employee salaries, administrative and operational costs for commercial facilities, government land rental cost, and building maintenance cost. Electricity costs are calculated based on the area of facilities and building circulation specifically for public apartment and its facilities, while for apartments and commercial facilities it is calculated based on the effective area of the unit or the total floor area of each building. Tariffs or costs for building operations and maintenance refer to the standard price calculations from the relevant agencies/authorities.

Furthermore, in order to determine investment feasibility indicators, especially those related to IRR and debt service coverage ratio (DSCR), the weighted average cost of capital (WACC) and Minimum Attractive Rate of Return (MARR) are calculated (as in Table VI). WACC is calculated based on various facts from the references/assumptions available at institutions in the banking/financial services sector.

TABLE V. Annual Costs Estimation of the Public Housing Project Investment through PPP Scheme

Electricity Cost				
Properties	Area Calculate d (m ²)	Needs of KwH per m ²	Electricity Cost /KwH (IDR)	Annual Cost (IDR)
Public Apartment	5,820	200	1,445	1,681,630,800
Public Facilities	500	200	1,445	144,470,000
Commercial Apartment	15,450	246	1,445	3,569,066,339
Commercial Facilities	10,075	246	1,445	2,685,462,536
				8,080,629,675
Water Cost				
Komponen	Area Calculate d (m ²)	Water Coeff.	Water price/m ³	Annual Cost (IDR)
Public Apartment	5,820	0.001	14,400	362,050,560
Public Facilities	500	0.001	14,400	31,104,000
Commercial Apartment	15,450	0.001	14,400	672,779,520
Commercial Facilities	10,075	0.001	14,400	438,721,920
				1,504,656,000
Employees Salary				
Position	Person	Monthly Salary	Annual Cost (IDR)	
General Manager	1	20,000,000	240,000,000	
Operational Manager	1	15,000,000	180,000,000	
Financial Manager	1	15,000,000	180,000,000	
HR and Administration Manager	1	15,000,000	180,000,000	
Staff	60	4,500,000	3,240,000,000	
			4,020,000,000	
Administration and Operational Costs for Commercial Apartment/Facilities				
Administration	1	110,300,000	1,323,600,000	
Operational and Miscellaneous	1	498,762,000	5,985,144,000	
			7,308,744,000	
Local Government Land Rental Fees				
Formula (based on regulations): [(3% x tax object selling value x Public Apartment Area) x 50%] + [3% x tax object selling value x Commercial Apartment/Facilities Area]		1	952,500,000	952,500,000
Building Cost	Building Area	Percent	Standard Price (IDR)	Annual Cost (IDR)
Operational & Maintenance	31,845	2%	5,817,971	2,779,099,297
Building Repair	31,845	1%	5,817,971	926,366,432
				3,705,465,730
Total of Annual Cost				
Electricity Cost				8,080,629,675
Water Cost				1,504,656,000
Employees Salary				4,020,000,000
Administration and Operational Costs for Commercial Apartment/Facilities				7,308,744,000
Local Government Land Rental Fees				952,500,000
Building Operational and Maintenance Cost				3,705,465,730
Total				25,571,995,405

TABLE VI. Calculation of WACC and MARR

Components	Percentage
Cost of Debt (CoD)	
Interest (from Financial Services Authority)	8.54%
Taxes	20.00%
CoD =	6.83%
Cost of Equity (CoE)	
Risk free rate	6.55%
Beta	1.53%
Equity risk premium	6.56%
Country risk premium	1.84%
Market risk	6.58%
CoE = Risk free rate + (Beta x Equity risk premium) + Country risk premium + Specific risk	15.07%
WACC	
Debt	
CoD =	6.83%
Weight debt =	60.00%
WACC of debt = CoD x Weight debt	4.0992%
Equity	
CoE =	15.07%
Weight equity =	40.00%
WACC equity = CoE x Weight equity	6.03%
TOTAL WACC = WACC of debt + WACC of equity	
WACC =	10.13%
Miscellaneous expense	0.50%
Contingency fee	1.5%
MARR	12.13%

In the cost of debt section, the reference interest rate used is 8.54% based on banking statistics from the Financial Services Authority of Indonesia. On the other hand, in the cost of equity section, the Risk Free Rate value obtained is 6.55% based on data from the Indonesia Bond Pricing Agency and a Beta value of 1.53% from Indonesia Stock Exchange. Furthermore, the equity risk premium value is 6.56% and the market risk value is 6.58% based on Indonesia Stock Exchange. Based on the calculation, the total WACC value is 10.13%. The WACC becomes the interest rate in the cashflow table and becomes a factor for calculating the NPV. Furthermore, the MARR calculated in this study is 12.13%.

Based on the results of the calculation of the income and cost structure as well as the investment reference interest rate in the form of WACC and MARR values, an investment cashflow table has been compiled for the 50-year concession period, assuming the construction is carried out for 2 years. Cash flow before tax (CFBT) is calculated based on the difference between total annual incomes and costs which is then reduced by taxes so as to produce cash flow after tax (CFAT). The asset depreciation method used as a reference in calculating taxes is *straight line depreciation* (SLD) for 50 years. The public apartment is assumed to be sold for 2 year. The total costs and revenues that have been calculated previously are assumed to fluctuate or increase by about 0.5% each year.

The PbP in this project is in accordance with the PbP range as the Rahadi [44] which is around 6-9 years and Ndigha [21] which is < 10 years. In addition, the project is attractive for the private partner in the construction industry if referring to Nikityuk [9] because the payback period is < 10 years. The cashflow table has obtained the annual present value (PV = 10.13%, 50, A, F) based on the calculation of the Microsoft

Excell software. The present value is based on the WACC coefficient of 10.13%. The total present value at the end of the investment year or NPV has been known, which is Rp. 610,063,962,923. A NPV that shows a positive value (NPV > 0) and is much larger than the initial investment, indicates that this investment is financially feasible.

TABLE VII. Investment Feasibility Evaluation Result

No.	Value	Indicators	Result
1	Payback Period: 7,45 Years Disc. Payback Period: 14,45 Years	Pbp < n (50 years)	Feasible
2	NPV = IDR 610,063,962,923	NPV > 0	Feasible
3	IRR = 13,18%	IRR > MARR (12.13%)	Feasible

The results of the evaluation of investment feasibility are still in accordance with the range of NPV values from several related literatures. The range of NPV according to Rahadi [44] is IDR 64,958,850,071-541,304,682.264, so this public apartment project can be accepted in housing/property industry. Moreover, the NPV value has also been more than 15% of the initial investment/capex, so it is in accordance with the Ndigha [21] study related to the amount of NPV and Rahadi [44] profitability in housing/property project investments. The relatively large amount of NPV in this project is also influenced by PPP concessions which tend to be long term (50 years) so that they can accumulate more profits for 50 years.

Furthermore, In the cash flow table, it can be seen that the IRR is equal to or exceeds the MARR value in years 21-22, so this investment as a whole can be said to be feasible if the concession period is more than 22 years. This is in accordance with Osinski [45] that Infrastructure projects require long-term financing. At the end of the investment period, the IRR has reached 13.18% which has exceeded the MARR so that it can be said that the investment is feasible. However, the IRR in this investment is quite low, the difference with the MARR is relatively small, which is 1.05% adrift.

Based on other previous studies, although the IRR value generated from this project is financially feasible, the value tends to be relatively low. The IRR value of this project is still below the value that can be accepted by the private sector if referring to the Ndigha [21] because it is still far below 20% and still below the minimum profit value (15%) based on the Hadiriyadi study [34]. However, other references related to the IRR value demonstrate that the IRR value of this project is still financially feasible. The IRR value of this project is in accordance with the IRR range of 12.45% - 27.53% if referring to the Rahadi [44], but is still relatively low or below the average. Furthermore, the IRR value of this project has approached the average IRR value of 13.77% based on historical data from 2009-2018 in the housing sector in Indonesia according to the study findings of Sumirat et al. [33].

Based on this analysis, the IRR value in the context of this study still needs to be increased in order to be more attractive to the private sector to participate in public housing projects under the PPP scheme. It may happen for some IRR values

higher than the WACC, the NPV turns out to be positive but with values that are not high enough to attract private capital [46]. Nevertheless, Nikityuk [9] claims that the obvious advantages for privat sector in this context are the ability to implement long-term projects with government guarantees of profitability, reduced government pressure and creation of a good image.

The government also requires to provide various supports, in terms of government funding or guarantee, land concession, as well as incentive regulations to further improve investment feasibility and attract the private sector to cooperate in developing public housing under the PPP scheme [25; 29; & 30]. According to Nyein and Hadikusumo [12] It is necessary to develop a financial system and provide special incentives to increase the success of PPP projects. Nikityuk [9] stated that the ratio of funds from the government and the private partner shall ranges from 45% / 55% - 20% / 80%. On the other hand, the private sector should be able to increase innovation and efficiency, both in terms of construction and management of mixed use building consisting of public apartments and commercial apartment/facilities to further increase profitability. Yuanqi and Su [11] suggested that the private sector should actively innovate in the profit model of affordable housing and promote the construction of affordable housing. Innovation and efficiency in both construction and property business development are required in order to reduce initial investment cost and annual costs as well as increasing revenues, thereby contribute to improve investment feasibility of public housing project through PPP scheme.

Another supporting criteria as an evaluation of investment feasibility is the debt coverage service ratio (DSCR). The DSCR value is needed as a consideration of debt service capacity during the investment credit period. The composition of debt:equity financing is applied using a two iteration scenario experiment, namely with a composition of 70:30 and 60:40. The comparison table for the composition of the financing is as follows.

TABLE VIII. Debt Service Coverage Ratio

Year	CFAT	Debt:Equity = 60:40		Debt:Equity = 70:30	
		Debt Payment	DSCR	Debt Payment	DSCR
1	86,943,947,973	46,086,433,509	1.89	54,044,938,383	1.61
2	85,848,824,119	46,086,433,509	1.86	54,044,938,383	1.59
3	45,690,437,119	46,086,433,509	0.99	54,044,938,383	0.85
4	45,690,437,119	46,086,433,509	0.99	54,044,938,383	0.85
5	45,690,437,119	46,086,433,509	0.99	54,044,938,383	0.85
6	45,690,437,119	46,086,433,509	0.99	54,044,938,383	0.85
7	46,740,299,449	46,086,433,509	1.01	54,044,938,383	0.86
8	46,740,299,449	46,086,433,509	1.01	54,044,938,383	0.86
9	47,207,702,444	46,086,433,509	1.02	54,044,938,383	0.87
10	45,200,829,322	46,086,433,509	0.98	54,044,938,383	0.84
11	45,434,530,819	46,086,433,509	0.99	54,044,938,383	0.84
12	45,668,232,317	46,086,433,509	0.99	54,044,938,383	0.85
	632,546,414,376	555,890,794,796	1.14	648,539,260,595	0.98

The comparison between the two compositions is assessed based on the highest DSCR value that can be produced under these scenarios. The debt payment period applied is 12 years with a WACC of 10.13%. Based on the table above, it can be seen that with a composition of debt and equity 70:30, a DSCR of 0.98 is obtained, so that this value is not feasible in terms of DSCR for 12 years. On the other hand, with a 60:40

financing composition has resulted in a higher DSCR of 1.14. The investment can be declared feasible and better based on the DSCR criteria if it is carried out with that composition (60:40).

V. CONCLUSION

The public housing project through the PPP scheme in this study has been feasible based on the investment feasibility criteria, namely as follows: IRR value of 13.18% > MARR (12.13%); a positive NPV value, which is Rp. 610,063,962,923; payback period of 7.45 years and discounted payback period of 14.45 years that still under investment period (50 years). Although the project is financially feasible, investment feasibility results is still relatively low especially in terms of the IRR value. Therefore, it is necessary to increase government support related to the land concession, funding/financial, guarantee, and other regulations incentives by the government side. On the other hand, the private sector also needs to develop innovation and efficiency in both construction and property development, with a fairly large proportion of area for commercial building provided by the government.

Further studies require to be carried out by evaluating the value of investment feasibility based on the private sector's perspective, through a survey so that the government has a reference in developing PPP schemes in the public housing program that can be attractive for private sector. Moreover, further research is expected to be able to develop various efficiency and innovation developments in order to increase the potential feasibility of public housing projects through the PPP scheme.

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