Developing affordable housing for low-income households in developing countries using participative payment

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Abstract. The government of Indonesia attempt to increase the standard living of the low-income households by providing affordable housing. The concept is implemented in Jakarta-the capital city of Indonesia as the pilot project in the past years. However, the operation faces several obstacles, and one of them is the debt of rental fees from the households from 2013 to 2017 about US$ 2,013,888.89 for all affordable housing exist in Jakarta. This research attempt to evaluate the potential business that can be implemented on the site to improve the payment capability from users. Marunda Affordable Housing in North Jakarta and Cipinang Besar Selatan in East Jakarta will be used as the case studies. Pairwise comparison and life-cycle cost approach are adopted to achieve the targeted objectives. The result shows a different type of business that can be applied to both case studies. One is related to marine processing industry, while the other is suitable with the manufacturing industry. Both business proposals generate a significant rate of return above minimum attractiveness rate of return in the related industry.

1. Introduction

The government of Indonesia aims to accelerate the country's competitiveness through strategic infrastructure project [1, 2]. It was proposed through administrative regulation No 2 in 2016 about the acceleration of national infrastructure project and one of them about housing. The government attempt to build one million affordable housing across the country which 70% of them allocated for low-income community and the rest will serve for commercial housing. This program is implemented in all provinces in Indonesia and divided into three stages, with the primary target location at the first stage is the capital city of Indonesia-DKI Jakarta.

According to the report [3], about 48.91% or equal to 4.89 million citizen of Jakarta live in slum area or improper house due to the exponential price of residential and high demand of houses every year. As vacant land for development is limited, vertical houses are the solution to provide an appropriate house for the low-income community. In the long term, it is expected that through a better place for a living may increase their ability in finding jobs and reduce the poverty level of the society [4, 5]. However, the operation of affordable housing in Jakarta face several obstacles, and one of them is the payment for rental fees by the user is low. Based on the report of the government of Jakarta, the users have the debt of about 29 billion rupiah or equal to US$ 2,013,888.89 from 2013 to 2017 periods for all the affordable
housing in Jakarta. Most of this low-income user had income below US$ 100 and was used for daily expenses such as transport, meals or sometimes children's tuition fees. Their earnings almost equal to the expenditure and therefore, the budget for rental fees is not available.

This research attempt to generate an alternative solution for the minimum capability of the households in paying the rental fees by taking into account a participative payment. The research will investigate the potential business that can be applied in the area considering the location, potential revenue that can be generated, employees needed for running the business and other related factors. The research output expected can be used to mitigate the increasing number of debt by the households and proposed a solution for related stakeholders in developing policy and regulations about affordable housing for low-income households in the near future.

2. Methodology
This research use a three stages approach to achieve the research objectives. In the first stage, a desk study from the literature review and benchmarking was used to generate variables and similar condition from other countries [6]. This stage will produce variables to assess the optimum business that potentially applied in the affordable housing. In the second stage, this research adopts a pairwise comparison for the analysis to determine the best selection for the business. It is a method to evaluate decision making by weighting the available criteria and proposed the alternative solution [7, 8].

In this research, four indicators were identified and will be compared with each other by using four-scale of importance level. The indicator composes Compound Annual Growth Rate (CAGR), net revenue, human resources, and market entry factor. Zero for less important, one for slightly important, two for moderate important and three for high important. Each score on each indicator will be sum up and the highest score selected as the best alternative. Pairwise comparison tabulation sample summarized in the following table.

| A | B  | C  | D  | E  | Score | %  | Key Letter |
|---|----|----|----|----|-------|----|------------|
| A | B  | C  | D  | E  | 4     | 22%| A          |
| B | C  | 1  | B  | 2  | 7     | 39%| B          |
| C | D  | 3  | E  | 1  | 6     | 6% | C          |
| D | D  | 2  | 6  |    | 33%   |    | D          |
| Total | 18 | 100% |    |    |       |    |            |

The weighted score of each indicator will be processed by adding an alternative solution to increase the business activity of an affordable house which may support the lack of compliance in paying the house rent to the government. The score from indicator will be multiplied by the score from the alternative solution to produce the total score and the highest ranking. In the last stage, an evaluation of the selected solution will be performed by taking into account the investment cost, operation, and maintenance cost and revenue. The analysis will produce the internal rate of return (IRR), and the value has to meet minimum discount rate and minimum attractive rate of return (MARR) of investors. MARR shall determine the project may attract private investors or shall remain government side and further subsidy required [9, 10].

This research uses a case study in two locations (Marunda and Cipinang Besar Selatan) of affordable housing managed by the government. Moreover, an in-depth interview with two experts related to affordable housing is conducted to evaluate and validate the research findings. One expert is a deputy of human resources in Ministry of Micro, Small and Medium Enterprises, Republic of Indonesia and the other is DKI Jakarta Expert Staff. The interview uses a semi-structured instrument and lasts for about 15-30 minutes. The result will be cross-checked the research findings, and a recommendation will be provided for the final report [11, 12].
3. Result and Discussion
Firstly, a pricing analysis was evaluated to determine the baseline cost of current retribution in the affordable housing. According to local regulation of the Jakarta capital city, No 3 in 2012 shows that monthly payment rental was different based on its location and characteristics. Those who lived in higher level and follows government program pay less rental fees. For instance, a user within the government program has to submit about 234,000 rupiah or equal to US$ 16.25 for a 30 square meter located on the first floor. On the other hand, the general user has to pay more than twice around US$ 35.28 for the same lot. A 36 square meter lot also available with higher price about 281,000 rupiah or equal to US$ 19.51 in the similar floor. Based on data from [3] and a decent living needs survey in the capital city in 2017 shows minimum wage province is US$ 233. The survey estimates 41.89% or 1,405,723 rupiahs (US$ 97.62) from the wage allocated for the housing. This figure will be used to determine which business that available to be implemented on affordable housing to support this needs.

3.1. Potential Business in the Two Locations
Marunda affordable housing is located in north Jakarta, close to the coastal area, therefore has enormous potential in fishery business. National and regional gross domestic product also support the argument that fishery sector increased significantly since 2014, especially in large and medium seafood processing industry, salt extraction, and tourism.

According to data from the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia until 2017, the total national fishery production reached 23.26 million tons contributed from 6.04 million tons of captured fishery and 17.22 tons of fish farming. However, from those potential, only several businesses in the fishery that can be applied on a small and medium scale. One of them in aquaculture (shrimp processing industry) and small-medium scale of fish processing (catfish fillet processing industry). The reports from similar source had shown that the industries ranked first and sixth respectively from the overall fishery sector.

On the other hand, the analysis also investigates commodities from except the oil and gas sector and found out ten potential commodities for export one of them is crafting. This business contributes US$ 71.3 million per month all over the nation. The demand also increases along the US and Europe from Indonesia such as craft knitting.

Compared to Marunda affordable housing that has natural resources from the fishery, Cipinang Besar Selatan affordable housing has potential due to its location near the trading market such as Rice Central Market and Toys Center. The commodity that can be delivered from this area shall relate to manufacturing processing industry. The research proposes education toys as part of the industry considering the location and source of material such as plastics and woods are nearby the location. Handicraft from scraps or secondhand also available for development. Homemakers will be empowered to process how to decorate and to form the craft for selling purpose. The local government and related ministry may be invited to conduct workshop or entrepreneur training. Last, the user also invited to collaborate in processing brown rice. Currently, many people have been considered healthy life and consuming brown rice has become part of people daily life. This potential should be captured and not to mention the location of this affordable housing near the rice center, so the marketing process no longer a problem.

3.2. Pairwise Comparison Analysis
The indicators were delivered to experts in the industry and produce the result for further analysis. Overall, market entry is the highest indicator among others as about 33.33%, followed by net revenue for about 26.67%. CAGR and human resources share the similar result with 20.00%. The pairwise analysis from experts answer can be seen in the table 2.
The pairwise comparison result is then processed to each affordable housing in Marunda and Cipinang Besar Selatan. Decision matrix on Marunda affordable housing shows close result between catfish fillet processing industry and knitting business with 4.12% differences.

Table 2. The Result of Pairwise Comparison

| B | C | D | Score | %    | Key Letter |
|---|---|---|-------|------|------------|
| A | A | 3 | C     | 3    | 20.00%     | A = CAGR    |
| B | B | 2 | B     | 2    | 26.67%     | B = Nett Revenue |
| C | D | 3 | C     | 3    | 20.00%     | C = Human Resources |
| D | 5 | 33.33% |     |      | D = Market Entry Factors |
| Total | 15 | 100.00% |       |      |             |

Catfish fillet processing industry is ahead on two indicators consist of CAGR score and human resource score with 66.67% and 83.33% respectively. On the other hand, knitting business surpasses other business alternatives in revenue and entry market with 71.43% and 66.67% in sequence. Despite leading equally on two indicators, knitting business has a lower score in CAGR and human resource indicators, thus ranked below fish fillet processing industry. The detail of the decision matrix score shown in the table 3.

Table 3. Decision Matrix on Marunda Affordable Housing

| Indicator | CAGR | Nett Revenue | Human Resources | Market Entry Factor 33.33% | Total Score | Rank |
|-----------|------|--------------|-----------------|-----------------------------|-------------|------|
| Weighted Score | 20.00% | 26.67% | 20.00% |                     |             |      |
| Alternative Recommendation |   |      |      |                     |             |      |
| Shrimp Processing Industry Score | 33.33% | 0.00% | 0.00% | 0.00% | 6.67% | 3 |
| Catfish Fillet Processing Industry Score | 66.67% | 28.57% | 83.33% | 33.33% | 48.73% | 1 |
| Knitting Industry Score | 13.33% | 7.62% | 16.67% | 11.11% | 14.85% | 2 |

Decision matrix on Cipinang Besar Selatan affordable housing shows toy processing industry as the recommendation for business in the site. Despite low score on market entry, toy processing industry score high on three indicators consist of CAGR, net revenue and human resource with 62.50%, 80.00 and 71.43% respectively. On the other hand, brown rice processing industry placed second only score high on market entry and not followed by other indicators. The detail of the decision matrix score shown in the table 4.
Table 4. Decision Matrix on Cipinang Besar Selatan Affordable Housing

| Indicator                      | CAGR   | Net Revenue | Human Resources | Market Entry Factor | Total Score | Rank |
|--------------------------------|--------|-------------|-----------------|---------------------|-------------|------|
| Weighted Score                 | 20,00% | 26,67%      | 20,00%          | 33,33%              |             |      |
| Alternative Recommendation     |        |             |                 |                     |             |      |
| Brown Rice Processing Industry | 0,00%  | 20,00%      | 28,57%          | 83,33%              | 38,82%      | 2    |
| Toy Processing Industry Score  | 0,00%  | 5,33%       | 5,71%           | 27,77%              |             |      |
| Score                          | 62,5%  | 80,00%      | 71,43%          | 0,00%               | 48,12%      | 1    |
| Handicraft Industry Score      | 12,50% | 21,34%      | 14,29%          | 0,00%               |             |      |
|                                 | 37,50% | 0,00%       | 0,00%           | 16,67%              | 13,06%      | 3    |

3.3. Marunda Affordable Housing Financial Analysis

The financial analysis considers catfish fillet processing industry for Marunda Affordable Housing. In term of catfish fillet processing industry, considerations have been investigated. The minimum size for this industry is 1.34 hectare, and Marunda has adequate land for development of more than five hectares. For buildings, a similar corporation running similar business was used. A 0.3 Ha of factory building combined with a 0.2 Ha of the warehouse will be constructed to support the industry. A 500 household that failed to submit rental fees expected as the employee and it may be adjusted based on the needs or technical requirement. Investment cost also considers related equipment and gears as well as training/workshop for development.

Operation and maintenance cost of this industry consist of building operation, depreciation, raw materials, electricity and water, marketing, employee salary, rental fees of affordable housing. Rental fees are added to cover the failure payment by the user which about 560 unit. Inflation was also taking into account based on Bank of Indonesia about 3.8% per year. The operation and maintenance and investment cost shall be covered by the manufacturing income. The research assumes that the production is about 60% and the product is 80% will be sold. It will produce about US$ 600,967.95. This figure generates an internal rate of return for about 20% or higher than the industry's WACC around 13.51%.

3.4. Cipinang Besar Selatan Affordable Housing Financial Analysis

The financial analysis considers toy processing industry for Cipinang Besar Affordable Housing. The housing has vacant land about 2,000 square meter and such dimension capable of accommodating the toy processing industry. The toy factory itself require an 800 square meter with a warehouse about 100 square meters. Other equipment and gear for running the industry will be considered for investment cost calculation.

The investment for this industry will increase in the year fourth and seventh due to production equipment only last about approximately three years; therefore new purchasing is required while monthly maintenance is performed. Overall the investment cost is US$ 516,894.24 includes tax. This figure is much lower about almost a quarter compared to investment cost required for catfish fillet processing industry in Marunda affordable housing. With such investment, this type of industry categorized as a medium-sized industry.

The operation and maintenance and investment cost shall be covered by the manufacturing income. The research assumes that 6,000 unit per month were produced and recruit 40 employees from the housing. The product estimated to be sold around 80% with US$ 9.03 per toy. The result shows a potential rate of return of about 15% or higher than industry’s WACC around 13.51%.

4. Conclusion

Affordable housing, particularly in the capital city of Indonesia, provides a housing solution for those who incapable to afford the increasing landed house price in Jakarta. Despite, low rental fees charged
by the government, many of them fail to pay for months. This research uses two case studies located in Marunda Affordable Housing in North Jakarta and Cipinang Besar Selatan in East Jakarta. The result shows that potential business that can be applied in each affordable housing by inviting those who yet to pay the rental fees. A catfish fillet processing industry was proposed as a solution for Marunda Affordable Housing, while a toy processing industry was selected as the optimum industry for Cipinang Besar Selatan.

The life cycle cost analysis shows that both industries might contribute not only pay the rental fees for the user but also provide income for their daily activities. The industry in Marunda Affordable Housing generates a significant rate of return about 20%. Although Cipinang Besar Selatan shows a lower rate of return compared from the other affordable housing about 15%, both of them surpass the minimum attractive rate of return from the investor perspective. Further research is recommended to be conducted by taking into account the division of responsibility between the government and private sector. Its attempt to not only release rental fees from the user but in the longer term to provide sustainability of social infrastructure. The government also suggested formulating policy and regulation to facilitate cost sharing and revenue sharing among stakeholders involved. Regular supervision also required to mitigate corruption or other means of bribery to the project and maintain its sustainability.

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