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Analysis of tariff adjustment for clean water usage

Keywords: tariff, investment, water, scenario

Introduction

The human need for water never decreases as it continues to grow over time and together with an increasing population. The availability of clean water is one of the important elements that must be fulfilled for daily human needs. The high population growth rate results in a growing demand for clean water (Abdul & Sharma, 2007). The urgency for clean water is also impacted by the number of residents, the number of house connections and the number of people per house (Firat, Yurdusev & Turan, 2009). The provision of clean water is of particular concern, especially for local water supply companies, called in Indonesian *Perusahaan Daerah Air Minum* (PDAM). Meeting the water needs for the community has increased, but the quantity of water available with adequate quality for the community is being increasingly limited. An increase in the number of customers should ideally be accompanied by an increase in services in the distribution of clean water to meet the daily needs of

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customers. However, the reality shows that the community still complains about the services provided by the PDAM because the water distribution does not meet the expectations of the community and has not reached all parts of the area.

As a clean water service provider company in Palembang City, PDAM Tirta Musi, has not been able to meet all of the community's clean water needs. The current service coverage is around 80%, which means that about 20% of the people of Palembang City do not have access to clean water (Tirta Musi, 2020). Although there is the increasing demand of customers of about 97.5%, it is known that thousands of prospective customers queue each year that cannot be processed (Tirta Musi, 2021). The main problem is that the production capacity is already in deficit so if additional customers are added, the deficit of water capacity will be even greater. Another problem is that the population is increasing every year, so the impact on the percentage of service coverage is getting smaller. The above-mentioned problems can be overcome by developing the water stock system, in Indonesian called *Sistem Penyediaan Air Minum* (SPAM), including increasing production capacity, expanding the pipeline network, reducing water loss, etc. (Bello et al., 2019). Water stock system development requires large funds for investment (Massarutto, 2007; Hukka & Katko, 2015; Aswar, 2019). A bank loan is the investment funding scheme chosen by the company loan. This scheme was taken to avoid the risks of investing in water supply for a long duration (above 30 years), such as concession schemes and other agreement schemes (Pribadi & Pangeran, 2015).

Water rates are an important tool for controlling the supply and demand of scarce water resources. Adjusting water rates is a crucial element in the transition to a market economy (Pinto, Tchadie, Neto & Khan, 2018; Pinto, de Carvalho & Marques, 2021). This reform leads to the utility's long-term, sustainable growth, which is based on customer demand and proper financing of all utility expenditures. Tariff reform entails significant changes in water regulation, the business environment, financial management strategies, subsidies, and public relations, in addition to the formulas and levels of tariffs (Babak & Byrne, 2002). Utilities are evaluating whether the current tariff structure is responsive to their current demands and whether it allows charging consumers fairly for their fair share of costs in light of the emerging trends and issues surrounding the tariff setting process. An efficient rate structure's goal is to maximize the utility's pricing objectives, which support the fundamental pricing concepts. After the necessary revenue has been determined, costs are distributed among the various water customers, and after that, rates are created to reflect the price of providing water service.

Reforming the current water pricing practices and tariff structures is crucial, especially when aiming to improve the water supply services (Dinar, Pochat

& Albiac-Murillo, 2015). Governments must consider that managing and operating services involve associated costs when delivering clean water services to the community (Pinto et al., 2018). As the level of profit has been set by Indonesian regulation – Permendagri No 71 of 2016 and not limited by predetermined tariff, various alternatives can be used. When choosing a tariff structure that responds to the goals of the utility and its community, there are significant obstacles in water pricing and tariff design (Whittington, 2003) especially based on the local context. Many previous researchers have discussed tariff adjustment (Juhery & Indryani, 2008; Indayani & Sunarto, 2013) the analysis of which only focuses on the full cost recovery (*FCR*) value – fixed charge in tariff formation (García-Valiñas & Picazo-Tadeo, 2015). According to Nurhotijah and Situmorang (2017), and Supriatini, Jumiari, Agihidayantari and Dewi (2017), the determination of water tariffs is based on the *FCR* method, namely calculating production costs obtained from the total expenditure per cubic meter of water. Furthermore, Artama (2018) provides an example of the analysis of tariff adjustment by fulfilling the *FCR* as well, but also analyzing the feasibility of the investment made financially. Previous research on tariff adjustments only focused on the fulfilment of the *FCR* without analyzing different alternatives yet. There is no optimal strategy that can be advised to single sector, according to these studies that analyze water pricing success across nations. Therefore, this study aims to evaluate the tariff adjustment of water supply company under different scenarios. This paper illustrated that tariff determination was carried out with several scenarios of increasing tariffs. This study is expected to provide a framework and lesson regarding tariff adjustment under different alternatives as well as offering cases of the achievement and failure of pricing policies in a local water company.

Material and methods

This research begins with a background that describes the condition of the availability of clean water in the city of Palembang and the condition of the PDAM Tirta Musi Palembang company. Problems have been found under these conditions. Furthermore, a literature study related to the problems discussed was carried out by identifying library needs, looking for references from previous studies, as well as for government regulations that regulate the provisions in the analysis of this research.

The analysis of the financial condition of the existing tariff is calculated by projecting the income and costs incurred as a result of the investment. Existing tariffs are tested to determine whether the *FCR* is compiled or not. The tariff adjustment

scenario is carried out by the *FCR* test, net profit and feasibility analysis. If it is *FCR*, then proceed to the feasibility analysis, if not then it is recalculated so that it is *FCR*. It refers to recovering all costs from sales in order to meet operational requirements and can be expressed numerically:

$$FCR = AWT > BC. \tag{1}$$

In Eq. (1), *AWT* is an average water tariff, *BC* is a basic cost is calculated based on the overall cost per cubic meter. Furthermore, if the calculation is found to not be feasible, then the tariff adjustment analysis is carried out to produce the feasibility of the investment. The investment is declared financially feasible if $NPV > 0$ and $IRR > 10.9\%$ as the minimum acceptable rate of return value (*MARR*). The Eqs (1) and (2) were used in the discussed method.

$$NPV = \sum_{t=0}^{n} \frac{A_t}{(1+i)^t} - IO. \tag{2}$$

$$IRR = i_1 + \left[\frac{NPV1}{NPV1 - NPV2} \right] (i_2 - i_1). \tag{3}$$

In Eqs (2) and (3), A_t is an annual cash flow after tax in the annual period, i is a discount rate, t is an annual period, *IO* is an initial outlay. Tariff adjustments were made in several scenarios. The tariff adjustment scenario can be seen in Table 1.

TABLE 1. Tariff adjustment scenario

Scenario type*	Increase	Concession period	Information
First scenario	varies	2 years	Achieving *FCR* and financially viable
Second scenario	8%	2 years	Annual inflation, which is 4%
Third scenario	varies	4, 6, 8, 10 years	The *FCR* lasts for a long time and is financially viable

*Description in the text.

Source: own work.

In the first scenario, it is assumed that the tariff increase is carried out every 2 years and the amount of the increase in tariffs varies. The amount of the rate increase is obtained by trial and error until the projected *FCR* value can be met. The determination of the percentage increase is made to a minimum with the shortest increase

time. This assumption is taken because there is hope that a small tariff increase will not burden the community in paying the clean water bill every month. The increase period is assumed to be every 2 years based on the shortest increase period allowed by the adequate Indonesian regulation (Permendagri). This shortest period is carried out to compensate for the small percentage increase in tariffs. If the amount of the increase can meet the *FCR* value, then a financial feasibility analysis is calculated. If the results are feasible, then the tariff can be used.

The second scenario assumes that the existing tariff increases by 8% every 2 years. In this scenario, it is assumed that the increase in water tariffs is equal to the inflation rate. The increase in costs due to inflation is assumed to be 4% per year, so with a period of increase of 2 years, the increase is assumed to be 8% (Bank Indonesia, 2022). The average inflation rate over the previous 10 years provides the basis for the assumption of a rise in inflation each year. Expenses are projected to increase proportionately to inflation. In this scenario, it is tested whether the increase in water tariff equal to the inflation rate can offset the increase in costs, so that it can still meet the *FCR* value. This scenario also analyses the feasibility of investments made after the tariff adjustment.

The third scenario assumes that the amount of increase in the existing water tariff varies. The increment period is assumed to be every 4, 6, 8 and 10 years. The amount of the tariff is carried out by trial and error until it can maintain the *FCR* rate for a period of 4, 6, 8 and 10 years. With a long period of increase, the magnitude of the increase in tariffs will be greater. If the *FCR* value has been met, then the investment feasibility analysis is calculated after the tariff adjustment is made. If the results are declared feasible then the amount of the increase can be used; if not feasible, then try and error is carried out again until the results of the investment feasibility are financially feasible. This scenario is carried out to accommodate the possibility if the increase period cannot be carried out with the shortest period, namely 2 years. This is based on the company's previous experience that the current tariff has not been adjusted for the last 10 years. The previous tariff adjustment was also carried out after 5 years, namely after the water tariff set in 2006 was adjusted to the water tariff in 2011. The increase period of 4, 6, 8 and 10 years was chosen to facilitate the calculation process which is considered to represent tariff adjustments for long periods of increase. The 3 scenarios generate mixed water revenues. This has various impacts on the fulfillment of *FCR*, profit and loss and investment feasibility. This scenario depicts the determination of the amount of the increase in tariffs for the period of the increase taken.

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Results and discussion

The PDAM Tirta Musi has several infrastructure buildings scattered throughout the service area in running its business. The intake building has functions to take raw water from its source, namely the Musi River located in 5 sites, including: Intake Ogan 1, Ogan 2, Karang Anyar, 1 Ilir and Borang. The raw water taken at the intake is sent to the clean water treatment plant (IPA) located in 7 locations, including: IPA Ogan 1, Ogan 2, Rambutan, Karang Anyar, Polygon, 3 Ilir and Borang. Clean water that has been treated is then sent to customers through distribution pipes. In drainage areas that are far from the IPA, a booster building is needed to temporarily accommodate and re-pump water to the distribution network in order to increase the drainage pressure. As many as 7 boosters are spread in the service area, including: Kertapati, Plaju, Km. 4, Punti Kayu, Alang-alang Lebar, Sako Kenten and Kalidoni. Intake, IPA and booster location maps can be seen in Figure 1.

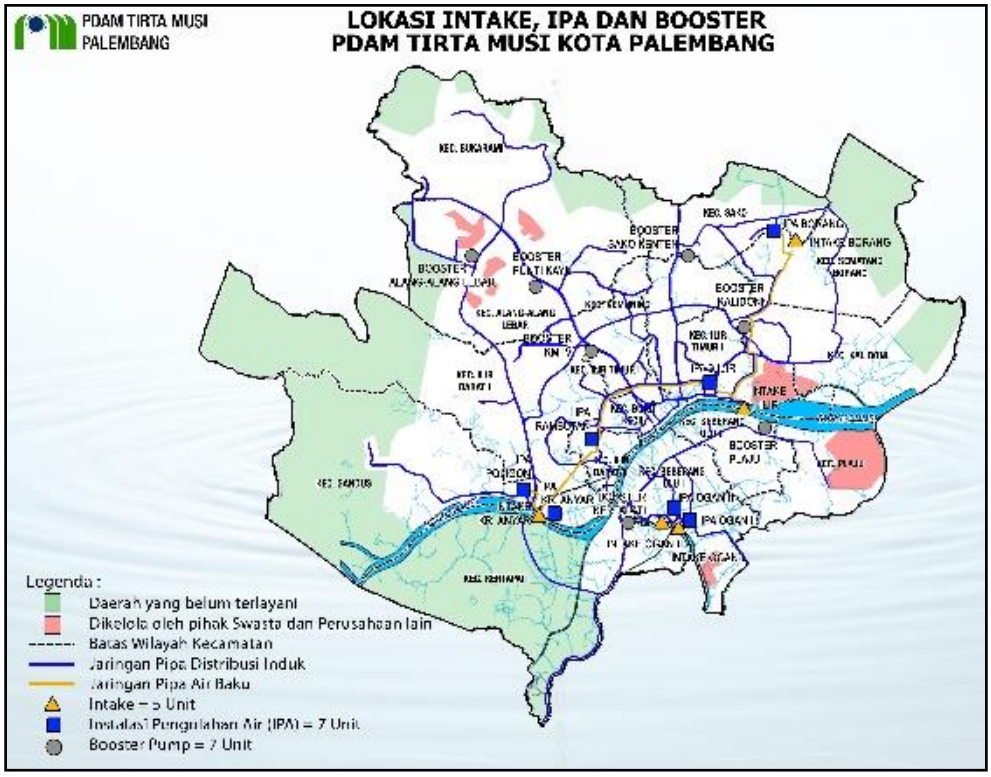

FIGURE 1. Intake, IPA and booster location map
Source: PDAM Tirta Musi Palembang.

The infrastructure buildings have not been able to meet the clean water needs optimally as shown in Figure 1. Production capacity is still experiencing a deficit and the service coverage has not yet reached 100%. Therefore, the company makes investments by preparing several activity program plans, including optimization of existing production, increased production capacity, replacement and addition of new pipelines, decreased water loss and support.

Existing financial analysis

This analysis is carried out on the financial condition prior to the tariff adjustment. The analysis was conducted to determine the impact of the absence of tariff adjustments for the next year on the company's financial performance. The existing tariff, which is still being used to this day, has been set since 2011, so that it has not been adjusted for 11 years. This analysis yields important information about whether tariff adjustments should be made or not. The impacts seen at this stage include the *FCR* and profit and loss generated by the company. Based on amendment Permendagri No 21 of 2020, *FCR* indicators need to be reviewed to determine whether water sales have been able to cover operational needs and the development of drinking water services or not. To obtain this, it is necessary to calculate the projected income and expenses.

Income analysis

Income can be divided into 2 types, namely water income and non-water income. Water revenue is income generated from the sale of water to customers, while non-water revenue is income generated outside of the sale of water that is tied to the PDAM business. Water revenues include water tariffs, fixed charges to customers, water meter maintenance and other water revenues other than piping. Non-water revenues include income from new connection fees, laboratory water inspections, reconnection, fines, replacement of damaged meters, replacement of parcel pipes, and other non-water revenues. Tariff income is obtained by multiplying the number of customers by the respective usage cubication and the water tariff charged. The cubication used uses data on water consumption of existing customers in 2020 as seen in Table 2. Water consumption in the coming year is assumed to have no change in value. The water tariff does not consist of a single value, but is divided into several tariff values that are formed according to the customer category and the volume of usage cubication. The arrangement of

these various tariff values is referred to as the water tariff structure as presented in Table 3. The water tariff structure was formed to accommodate cross subsidies between tariffs for low-income, high-income customers and business customers. In addition, it is subdivided according to the progressive consumption volume of each customer category.

TABLE 2. Existing water consumption data

Customer category	Number of customers	Water consumption [m^3]
IA/General Social	31	35 007
IB/Social	2 203	1 685 603
Very Simple IC/RT	1 277	477 438
Special Social I/D B	624	651 299
Government Hospital I/E	5	620 542
II/A Old Village RT	102 923	32 845 681
II/B Medium RT / Office	151 523	50 861 891
II/C TNI / POLRI Office	602	1 78 040
ll/D Small Business	11 841	5 420 534
ll/E RT and Luxury Boarding House	5 082	2 822 557
III/A Small Commerce	21 339	6 530 937
III/B Big Commerce A	3 337	3 615 130
III/C Big Commerce B	49	630 026
Special Commerce	2	64 813
Water Terminal	–	–
Total amount	300 838	107 739 498

Source: own work.

The calculation of non-water revenue is simplified into 3 parts, namely new connection revenue, other non-water revenue and other income. Revenue for new connections is obtained from customer projections that are adjusted to the customer category multiplied by the tariff for new connections. The percentage of other non-water revenues to water revenues and other revenues to water revenues are used as assumptions for the projection. The percentage assumption is multiplied by the projected water revenue in the projected year. The revenue projections are made under the assumption that there won't be any changes to the tariff, but that there will be more connections overall. The pattern of connection growth over previous 5 years reveals a rise in the number of connections.

The revenue projection is depicted in Figure 2, illustrating that the income increased from 2020 to 2033. However, it decreased slightly in 2034 and was

TABLE 3. Tariff structure

Customer category	Value	Customer category	Value
General Social / IA	×	TNI / POLRI / II C	×
0–10 m^3	605	0–10 m^3	2 365
11–20 m^3	605	11–20 m^3	3 320
21–30 m^3	605	21–30 m^3	3 630
> 30 m^3	605	> 30 m^3	4 840
Special Social A / IB	×	Small business / II D	×
0–10 m^3	800	0–10 m^3	3 630
11–20 m^3	1 000	11–20 m^3	4 235
21–30 m^3	1 340	21–30 m^3	5 740
> 30 m^3	1 600	> 30 m^3	6 645
Special Social B / ID	×	RT and Kos Luxury / II E	×
0–10 m^3	1 000	0–10 m^3	4 235
11–20 m^3	1 825	11–20 m^3	4 840
21–30 m^3	2 420	21–30 m^3	6 050
> 30 m^3	3 025	> 30 m^3	7 550
Very simple RT / IC	×	Small commerce / III A	×
0–10 m^3	935	0–10 M3	4 530
11–20 m^3	1 510	11–20 m3	5 440
21–30 m^3	1 815	21–30 m3	6 050
> 30 m^3	2 420	> 30 m3	9 065
Government hospital / IE	×	Big commerce A / III B	×
0–10 m^3	1 340	0–10 m^3	5 285
11–20 m^3	2 155	11–20 m^3	5 740
21–30 m^3	3 025	21–30 m^3	6 645
> 30 m^3	3 630	> 30 m^3	10 420
Old Village RT / II A	×	Big commerce B / III C	×
0–10 m^3	1 595	0–10 m^3	5 740
11–20 m^3	2 420	11–20 m^3	6 050
21–30 m^3	3 025	21–30 m^3	7 550
> 30 m^3	3 630	> 30 m^3	10 880
Medium RT / Office / II B	×	Special commerce	×
0–10 m^3	1 845	0–10 m^3	18 125
11–20 m^3	2 725	11–20 m^3	18 125
21–30 m^3	3 320	21–30 m^3	18 125
> 30 m^3	4 235	> 30 m^3	18 125
×	×	Water terminal	18 125

Source: own work.

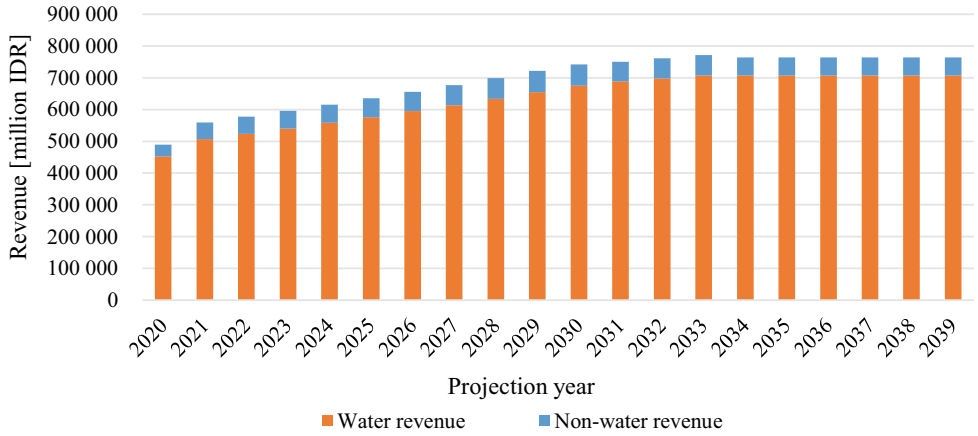

FIGURE 2. Revenue projection (1 USD = 15,000 IDR)
Source: own work.

consistent until 2039. It is also seen that water revenues have a dominant portion in contributing to company revenues. This means that the effect of water tariffs is very large on the company's overall revenue.

Expense cost analysis

The cost components include the operating and maintenance costs, depreciation or amortization, loan interest and other costs. Operation and maintenance costs are the entire series of costs of running a business from water sources, production to distribution. Operation and maintenance costs include personnel costs, electricity/fuel, chemicals, raw water, administration and general and maintenance costs. Depreciation and amortization costs are all depreciation expenses of assets that are in shape or form. Borrowing interest costs are interest costs generated from loans to banks including commitment fees, penalties and other financial costs related to loans. Other costs are unexpected costs that cannot be separated from the company's business.

These costs are assumed to increase due the 4% inflation. Depreciation costs are projected using the straight-line method with a plan life of 20 years, so that the projected expenses are carried out from 2020 to 2039. The projected expenses can be seen in Figure 3 – the highest expenses are personnel costs, while the lowest expenses are other costs. Personnel costs have the highest rate of increase among other costs. Expenses have increased every year. If the total expenses in 2020 are 327,600,842,766 IDR and in 2039 increased to 1,076,940,135,648 IDR.

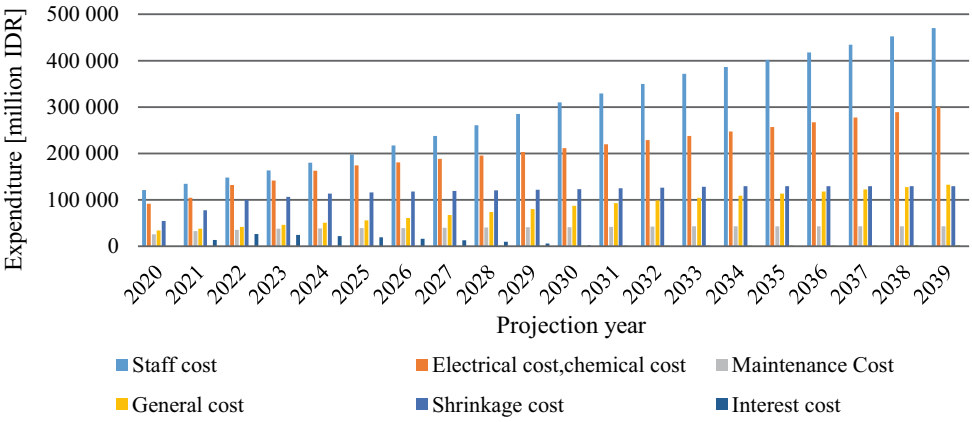

FIGURE 3. Expenditure projection (1 USD = 15,000 IDR)
Source: own work.

Full cost recovery analysis and existing profit and loss

The calculation of the full cost recovery (*FCR*) begins with calculating the cost of goods sold (COGS), which is the sum of all operational costs and development costs. These costs include personnel costs, electricity/fuel, chemicals, raw water, maintenance, administration and general expenses, other costs, depreciation costs and interest costs. The total cost is then divided by the volume of distributed water which has been reduced by the volume of water loss. The volume of water loss is assumed to be 20% according to the actual data. The result is the rupiah (IDR) value per cubic meter called the basic cost. Furthermore, it is essential to calculate the average rate by dividing the tariff revenue by the cubication volume sold, resulting in a per cubic rupiah value. The *FCR* value can be met if the average water tariff is greater than the basic cost. Figure 4 shows that the average water tariff chart trend is stagnant, while the basic cost chart trend is increasing every year. This makes the gap between the average water tariff and the basic cost each year bigger. The *FCR* value fulfilled can only last until 2022, while from 2023 onwards the *FCR* value cannot be fulfilled again. This means that the company only benefits from sales until 2022, while from 2023 the company suffers a loss for every cubication of water sold and the losses increase in the following year.

The calculation of net profit begins by adding up the total revenue, both water and non-water revenues. These costs include operating costs, depreciation, interest and taxes. Net profit is obtained by subtracting the total income by the total

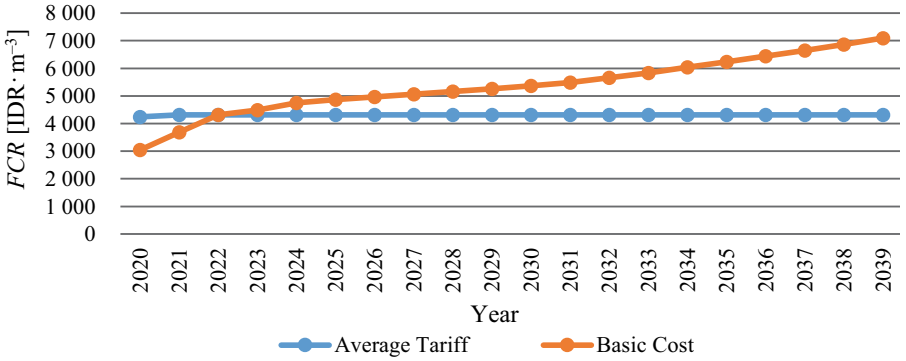

FIGURE 4. The full cost recovery (*FCR*) value projection (1 USD = 15,000 IDR)
Source: own work.

expenses. Figure 5 presented the profit and loss projection. This indicated the net profit projected to decrease every year until 2027. Starting from 2028 the company cannot generate profits and suffer losses until the projected year 2039.

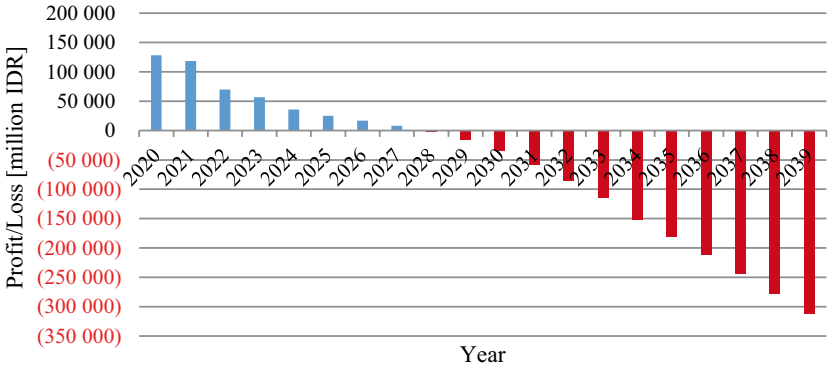

FIGURE 5. Profit and loss projection (1 USD = 15,000 IDR)
Source: own work.

Based on the results depicted in Figure 5, it shows that there is urgency to develop tariff adjustments which is expected to be able to balance the company's income against the company's expenses as well as cover operational costs. Tariff adjustment in this study was carried out in several scenarios. The scenario results inform the impact that occurs after the tariff adjustment.

Price adjustment scenario analysis

Several possible scenarios are developed to make tariff adjustments in order to analyze the full cost recovery (*FCR*), the company's profit and loss projections. In addition, the financial feasibility of the investment is also reviewed if the *FCR* has been fulfilled. The tariff scenario is declared financially feasible if $NPV > 0$ and $IRR > 10.9\%$ as the *MARR* value. The scenario is carried out by increasing the existing tariff structure and is projected for a certain period of increase according to the assumptions made for each scenario. The principle in developing this scenario is that the amount of increase is chosen as small as possible but still meets the *FCR* and is financially feasible. The scenario for the tariff adjustment carried out is as follows:

First scenario rate adjustment

The first scenario assumes that the tariff increase is carried out to achieve the *FCR* value. The existing tariff structure is increased in such a way by means of trial and error calculations, so that the average water tariff can cover the basic cost. In addition to the tariff structure, administrative costs and new connection costs are projected to increase proportionally to the increase in the tariff structure. This scenario is projected to increase the tariff every 2 years. The increase in tariffs in the first scenario also causes the average water tariff to increase. The average water tariff in 2022, which was originally 4,313 *IDR*, has changed to 4,528 IDR, so that the average water tariff exceeds the basic cost in 2022. The projection of the average water tariff can be seen in the projected *FCR* value as shown in Figure 6. Figure 6 illustrates that the increase in tariffs in this scenario can change the average water tariff to increase compared to the average water tariff under the conditions of the existing tariff structure. The graph of the average water tariff which was originally in 2023 and onwards is below the basic cost graph has changed to above the base cost graph. This means that with the increase in tariffs carried out in the first scenario, the *FCR* value can be fulfilled.

The calculation of the financial feasibility of an investment requires a net cash flow value. Net cash flow is obtained by subtracting cash inflows with cash outflows over 20 years. The projected present value of the benefit (*PVB*) can be seen in Table 4.

Table 4 shows that the *NPV* value generated in the first scenario is –486,291,930,693 IDR. This means that the first scenario is not financially

TABLE 4. Projected present value of benefit (*PVB*) projection

Year	Investment value [million IDR]	Net cash flow [million IDR]	Present value of benefits [million IDR]
1	458 832	11 872	10 705
2	455 010	35 715	29 040
3	135 356	40 789	29 905
4	143 728	36 877	24 380
5	42 888	138 331	82 463
6	39 990	132 250	71 089
7	27 232	166 174	80 546
8	28.306	157 718	68 933
9	29 458	173 578	68 409
10	30 622	163 429	58 078
11	31 851	205 700	65 915
12	33 117	215 814	62 359
13	34 459	235 418	61 338
14	35 815	216 794	50 934
15		279 389	59 188
16		257 130	49 119
17		292 572	50 396
18		268 499	41 704
19		297 200	41 624
20		271 164	34 245
Total	1 526 664		1 040 372
NPV = 1 040 372 – 1 526 664 = –486 291			

Note: 1 USD = 15,000 IDR.

Source: own work.

TABLE 5. First scenario rate increase change

Year	% Beginning	% Change
2022	5	8
2024	9	12
2026	5	8
2028	4	7
2030	4	7
2032	5	8
2034	7	10
2036	7	10
2038	6	9

Source: own work.

feasible after $NPV < 0$. Therefore, the tariff increase in the first scenario is recalculated. After the trial and error, the first scenario can be feasible after the rate increase changes as shown in Table 5. Changes in the tariff increase in the first scenario make changes to the fulfillment of the *FCR* value. With the change in the rate increase as shown in Table 5, the investment can be declared feasible after the *NPV* value is 31,107,373,716 IDR and the resulting *IRR* value is 11.095%.

Second scenario tariff adjustment

The tariff adjustment in the second scenario is assumed to increase in tariffs equal to the increase in the inflation rate, so it is expected that the increase of income is equal to the rate of increase in costs incurred. In addition to tariffs, administrative costs and new connection fees are assumed to increase at the rate of inflation. This scenario was taken because the existing tariff conditions can still maintain the *FCR* until 2022, but because revenues are stagnant and costs continue to increase due to inflation. This scenario tests whether the *FCR* can be maintained or not, if the rate of increase in tariffs is the same as the inflation rate. Net income for the 2 periods of increase in general experienced an increase. However, net profit has decreased from 2020 to 2023 with net profit not reaching 100,000,000,000 IDR, but in 2024 and beyond net profit has increased. The feasibility calculation in the second scenario produces an *NPV* value of –99,361,910,101 IDR. The *IRR* value is 10.25%, so the investment is declared financially unfeasible. The results of the analysis in the second scenario show that an increase in tariffs to the level of inflation can result in water tariffs that can meet the *FCR* value. However, this rate increase cannot result in the feasibility of the investment being made. Therefore, tariff adjustment in the second scenario is not recommended for use.

Third scenario tariff adjustment

The tariff adjustment in the third scenario is carried out to determine the amount of tariff increase that can be used if the tariff increase period is longer. In this scenario, it is assumed that the tariff increase period is carried out every 4, 6, 8 and 10 years. The amount of the tariff is obtained by trial and error so that the tariff can maintain its *FCR* value for each period of increase. The first tariff increase is assumed to be in 2022. In addition to the water tariff, it is also assumed that an increase in monthly administrative costs/expenses and the cost of new connections is assumed. The amount and period of increase is carried out in the same year as the tariff increase. Based on the results of trial and error calculations, the amount of tariff increase is obtained so that it reaches the *FCR* value for each period of increase. The amount of the tariff increases for the four-, six-, eight- and ten-year tariff increase periods is 13%, 19%, 25% and 29%, respectively. Figure 6 shows that a longer period of increase has a higher average water tariff at the start of the increase, so it can maintain the average water tariff graph above the basic cost graph longer. On the other hand, a shorter increase period results in a relatively smaller average water tariff.

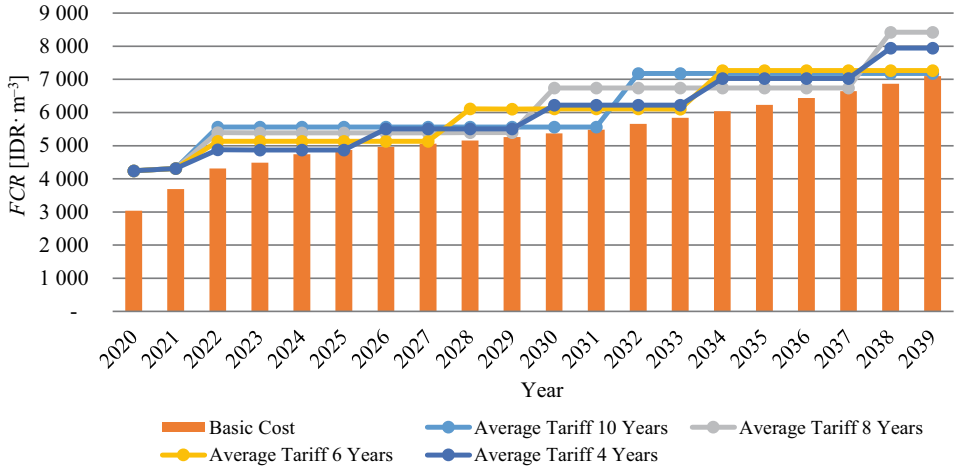

FIGURE 6. The full cost recovery (*FCR*) value projection (1 USD = 15,000 IDR)
Source: own work.

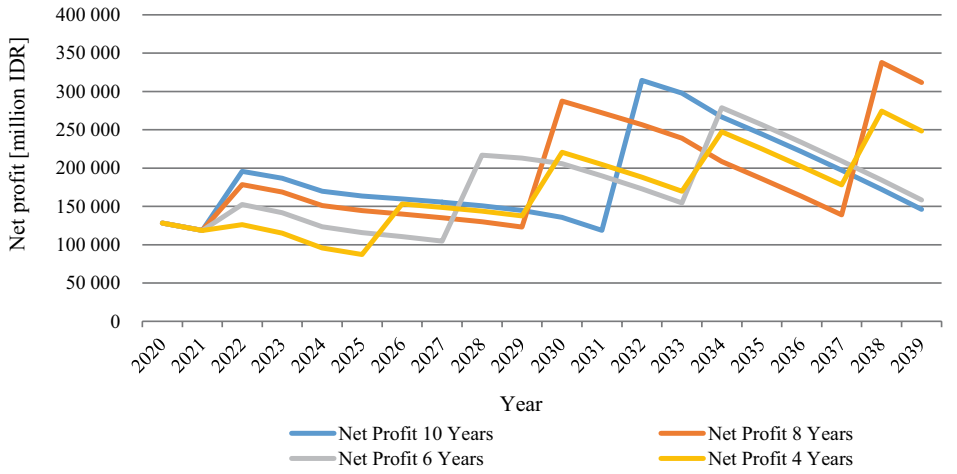

FIGURE 7. Net profit projection (1 USD = 15,000 IDR)
Source: own work.

In Figures 6 and 7, the graph increased sharply in a year where tariffs were increasing. However, in the following year the net profit graph decreased until the tariffs increased again. This means that when there is no tariff adjustment, net profit growth decreases. Based on the analysis of the financial feasibility of investing, the third scenario results in the *NPV* value for the period of increasing 4, 6, 8, and 10 years, respectively, amounting to –248,029,269,288 IDR, –181,682,498,528 IDR,

–70,554,971,185 IDR and –56,008,269,866 IDR. The *NPV* value is still below 0, so with the increase in tariffs carried out in this scenario, the investment is declared unfeasible. Figure 7 shows that the net profit is significantly impacted by the water tariff adjustment. Net profit will decline in the absence of a tariff rise.

The results of the developed tariff adjustment scenario show that a small percentage increase in tariffs can be made if the increase period is relatively short. On the other hand, a large percentage increase in tariffs can last for a relatively long time. An increase in tariffs with an increase equivalent to inflation can only meet the *FCR* value, but is not feasible in the analysis of financial feasibility of investment. The developed scenario also shows that the increase in tariffs cannot be made only to balance the costs that must be incurred, but it must produce a reasonable profit, so that the increase in tariffs designed can be declared feasible for the investment.

Based on the above considerations, the first scenario gives the most ideal result to be applied as a new water tariff. The magnitude of the increase in the first scenario has a relatively small percentage, so customers are expected not to object to the increase made. In terms of the trend of net profit growth, it provides a better trend with gradual net profit growth, so that the company's financial performance appears to be growing consistently. In addition, the investment returns are relatively similar as in the third scenario.

Conclusions

This paper has presented that tariff determination was carried out with several scenarios of increasing tariffs. Based on the results of the analysis carried out on the water demand and the adjustment of water usage tariffs at PDAM Tirta Musi Palembang, tariff adjustment scenarios were carried out with variations in the percentage increase in tariffs and the period of the increase in tariffs. This scenario showed that the increase in tariffs will have an impact on increasing the company's income. The small percentage increase in tariffs must be balanced with a short increase period, so that the *FCR* value can still be met. On the other hand, with a large percentage increase in tariffs, *FCR* compliance can last for a relatively longer period of growth. The most ideal scenario of the 3 developed ones is the first scenario. The first scenario resulted in a relatively smaller increase in tariffs but was able to meet the *FCR*. In addition, the net profit growth trend generated by the first scenario increases gradually. To conclude, this study has provided a framework and lesson regarding tariff adjustment under different alternatives as well as offering cases of the achievement and failure of pricing policies in a local water company.

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Summary

Analysis of tariff adjustment for clean water usage. This study aims to assess the water supply company's tariff modification under various circumstances. To evaluate the financial situation if no tariff modifications were made, the study first conducted an examination of the existing financial data. A tariff adjustment scenario is also run through an investment feasibility test and until it reaches the full cost recovery (*FCR*). A variety of scenarios for tariff adjustment were run, each one with a different percentage increase in tariffs and a different time period for the increase in tariffs. These scenarios were based on the findings of the

analysis done on the water demand and the adjustment of water usage tariffs at PDAM Tirta Musi Palembang. This hypothetical situation demonstrated how higher tariffs will affect the company's ability to increase revenue. To sum up, this study has offered a framework about tariff adjustment under various alternatives, and examples of successful and unsuccessful pricing strategies in the local water company.