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Public-private partnerships scheme of pioneer train case study in South Sumatera area

Introduction

Transportation challenges for developing countries, such as Indonesia, include increasing travel demand, rising vehicle ownership (Rahman et al., 2012), safety issues, congestion (Obeng-Atuah et al., 2016), unreliable public transportation services, unreliable pedestrian facilities, and irregularities in traffic discipline (Adarkwa & Poku-Boansi, 2011). To overcome these challenges, the government began promoting an affordable and effective mass transportation system (Poku--Boansi & Marsden, 2018). The government chose rail transportation because it is the most suitable transportation, even better than road transportation and more environmentally friendly (Carpintero et al., 2010; Kulshreshtha et al., 2017). It can also reduce travel time and help save energy (Oliveira Cruz et al., 2015). This transportation is also being promoted in Indonesia by the government through

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the Regulation of the Minister of Transportation of the Republic of Indonesia No. 22 of 2020 concerning transportation rates for people by pioneer trains (Berita Negara Republik Indonesia Tahun 2020 Nomor 464). The pioneer train line was built in a new area. It has not been able to bring commercial benefits to its operators. Until now, there have been 6 pioneer railway lines in various cities, all of them funded by the Indonesian Government (Mulyono, 2023). No pioneer trains have yet been funded through the public-private partnerships (PPP) scheme yet. All pioneer trains in Indonesia are purely funded by the state through the state budget (APBN). One of the pioneer trains in Indonesia is the Kertalaya rail bus which was launched by the government on February 19, 2009. Kertalaya train was first produced in Indonesia using the concept of a combination of light buses and trains produced by PT. INKA. Kertalaya train service is a type of AC economy commuter. The purpose of its construction is to reduce the congestion of the highway on the Palembang-Prabumulih road. The rail bus on the Kertalaya train consists of three carriages. All of the funding of Kertalaya construction and operation is funded by the government. Similar trains are used in other countries which is carrying passengers from one place to another (Poku-Boansi & Marsden, 2018; Li & Love, 2020; Meng et al., 2022; Xiahou et al., 2022).

The costs of the construction, operation, and maintenance of Kertalaya trains are very large. The right funding scheme is needed to overcome these financing problems. Many financing schemes have been carried out to fund railway projects, including full funding by the government, tax subsidies (Noviarti et al., 2023), privatization (Tomikawa & Goto, 2022), and PPP. Public-private partnerships are considered as one of the right schemes for funding the project because business entities can effectively bridge the limited financial resources of the government (Christiansen, 2008; Chang, 2013; Rahman et al., 2019). This type of financing scheme has many risks and challenges (González-Medrano & Martín, 2021; Huang et al., 2022). Many studies have shown that PPP financing schemes have not been able to achieve the goal of obtaining decent financial results. At the end the operation and maintenance, these modes are taken over by the government (Bernardino et al., 2010). For examples: the UK Channel Tunnel, London Underground and Taiwan High Speed Rail (Gangwar & Raghuram, 2015). Based on the results of the study, the decline in railway operations is due to inadequate investment in infrastructure, poor service, lack of market orientation, and large numbers of staff/crews in railway operations. The success factor of the railway transportation are trains that have to be connected with commercial areas, housing, campuses, zoos, and have comfortable facilities (Carpintero et al., 2010; Liao, 2016). Regulatory reform is needed to create an environment which supports the private sector to participate in PPP scheme funding (Rock & Wu, 2020). Usually, one train problem in Indonesia is about the ticket fares. The passenger ticket fares determined by the government through the approval of the DPR (Xiahou et al., 2022).

This study aims to analyze the most effective unbundling scenario for the operation and maintenance of the Kertalaya pioneer train majoring in Indralaya – Tanjung Senai. The evaluation is carried out by calculating life cycle costs and sensitivity analysis in accordance with applicable regulations. The scenario created is based on the increase in ticket prices and support from the government for the Kertalaya train operation and maintenance plan by calculating the net present value (*NPV*) and internal rate of return (*IRR*) values. The novelty of this research is because so far there has been no pioneer train in Indonesia that is financed using PPP. For this reason, in this study we attempted to use the PPP scheme in preparing pioneer trains.

Material and methods

This research is located on the Kertalaya pioneer train line that connects Kertapati (Palembang) and Indralaya (Ogan Ilir). This train line is included in Regional Subdivision III of the South Sumatra area (Fig. 1).

There are four stages of research: Stage 1. Literature study and focusing on the problem; Stage 2. Field measurement; Stage 3. Preparation of the cost budget plan for Indralaya – Tanjung Senai railway line and calculation of life cycle cost (LCC) and Stage 4. Simulation of distribution of responsibilities in the PPP scheme.

Stage 1: The literature sources are taken from the Scopus reference. Secondary data were collected to support this research. They include: unit price analysis (AHS) of rail roads and railway bridges, evaluation report of operating the Perintis train Kertapati – Indralaya line which is owned by the Ministry of Transportation, and passenger data from PT. KAI Divre 3 South Sumatra. From the evaluation report of the Pioneer Train book, it was found that there was a government plan to build the Indralaya – Tanjung Senai rail line (Ogan Ilir Regency Government Center). Based on an unpublished report from PT. KAI, the number of passengers of the Palembang – Indralaya Kertalaya train can be seen in Table 1. After 2019, the Kertalaya train was no longer used because it was hampered by overhaul costs and COVID-19 conditions that caused Unsri students to study online.

Stage 2: Based on the secondary data, measurements were made to the field from Indralaya station to the station planned to be

TABLE 1. Number of Kertalaya train passengers for five years

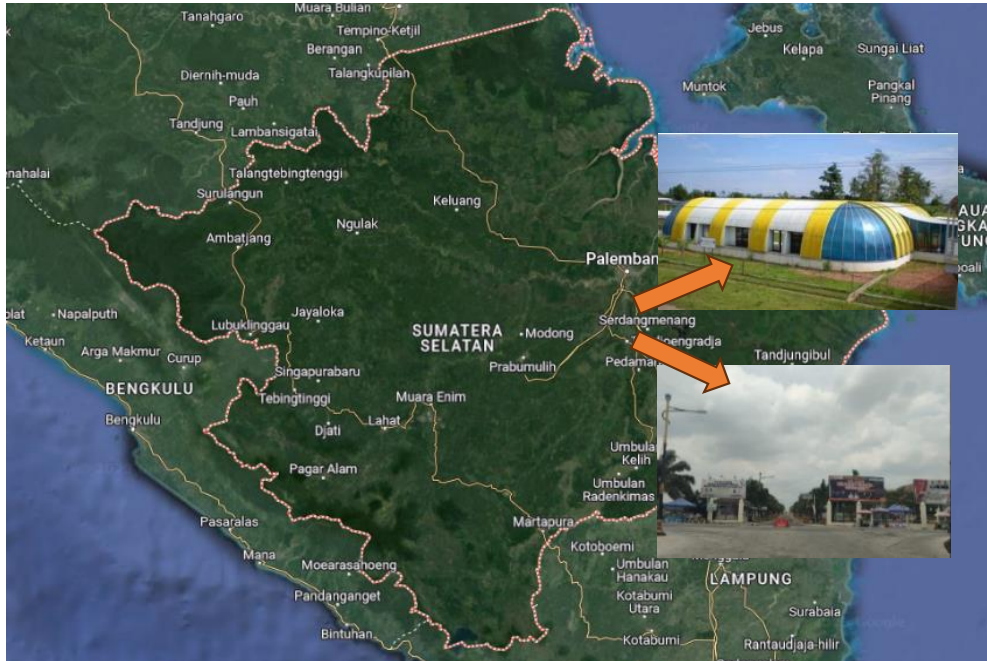| Year	Number of passengers
2015	27 331
2016	28 941
2017	32 968
2018	23 835
2019	20 842

Source: own work.

FIGURE 1. Research location of Indralaya Station and Tanjung Senai Integrated Office Complex (KPT)
Source: own work.

built in Tanjung Senai. Measurements were carried out in order to obtain accurate measurement data for the preparation of the RAB for the Indralaya – Tanjung Senai rail road plan.

Stage 3: Through this approach, the total cost of Capex and Opex for 40 years is calculated. In this study, the cost of rail line construction or capital expenditure (Capex), which is calculated, includes the construction costs (landfill, railway, crossing, signal, telecommunications, bridges, and stations), land acquisition costs, train revitalization costs, planning costs, licensing costs, and environmental impact analysis (AMDAL) costs. Operational and maintenance costs or operational expenditure (Opex) are taken into account include maintenance of railway lines, maintenance of carriage components, train operational costs, and wages/salaries of staff and operators. All Opex costs and revenue components are calculated over 40 years. The planned duration of the concession is 40 years. It took 40 years because the pioneer train project has a high level of risk for business entities. This pioneer train only has a limited target of passengers in the environment of Unsri students and employees at the Ogan Ilir Regional Government. So that the long

concession period will make the management business entity more interested in being involved in this project. The 40-year period is also taken from previous research which also discussed PPP railway projects.

Stage 4: In this stage, three scenarios were made for the distribution of responsibilities in the PPP scheme. This scheme was carried out to attract private investors to be involved in financing the pioneer Kertalaya train by showing positive *NPV* and significant *IRR* (Kim et al., 2022). Three scenarios were chosen because they could be the basis for several other scenarios to be created by raising and lowering the percentage.

In this study, there is an existing 26 km long Kertapati – Indralaya train line. It was assumed that this rail is still in good condition and can be used. The focus of this paper is on the distribution between government and private responsibilities on operations, maintenance and improvement of passenger railway facilities and infrastructure. Meanwhile, on the planned route between Indralaya and Tanjung Senai will be built a new rail unit along 5.2 km. Consideration is made by taking into account the value of *NPV* and *IRR*. *NPV* is done by taking into account the amount and forecast of discounted future cash flows at the current time. Formula used $NPV = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} - C_o$, which C_t is a net cash flow during the period, t is a period, C_o is the total initial investment, r is a discount rate [%].

Internal rate ratio is calculated by adding up the present value and future flow of funds minus the investment value. A calculation scenario will be carried out based on a combination of *NPV*, *IRR* and government support.

In this study, a discount rate of 15% was used because it was taken based on the risk of investment opportunities from the investor's point of view. In this case it is possible for investors to use several sources of capital. In addition, research on trains also uses the same value.

Results

Investment cost (Capex) on the Indralaya – Tanjung Senai rail road development plan

In this study, the is construction of a new 5.2 km long train line was assumed from the end point at Indralaya station to the Tanjung Senai Integrated Government Office (KPT). The investment cost of its railway project is fully borne by the government. Investment costs. The construction of new rail lines in this study consists of components that in detail can be seen in Table 2.

TABLE 2. Investment cost of Indralaya rail road construction project – KPT Tanjung Senai

| Category	Component	Cost [IDR]
Construction cost	Earthworks	9 556 500 000
	Railway single track	20 800 000 000
	Crossing road	2 250 000 000
	Signal	1 014 000 000
	Telecommunications	936 000 000
	Bridge	11 000 000 000
	Large Station	10 000 000 000
	Total	**55 556 500 000**
Others	Land Release	2 150 000 000
	Train revitalization	18 334 001 000
	Total	**18 334 001 000**
PM cost	VAT	
	Project management and consulting fee	227 781 650
	Licensing fees, AMDAL (0.5% from construction)	91 670 005
	Total	**319 451 655**

Source: own work.
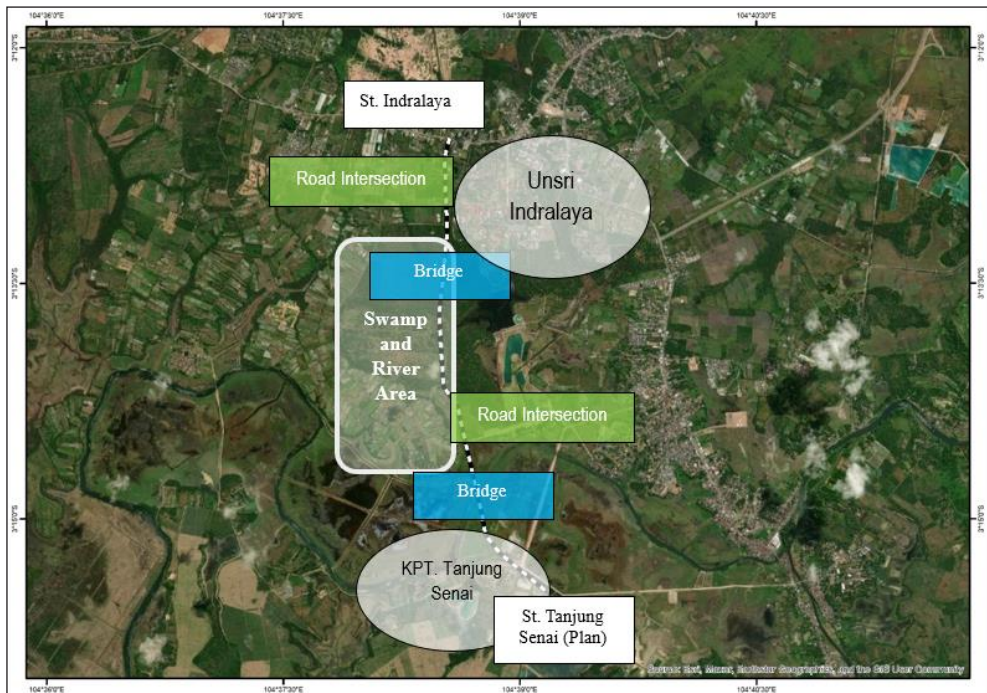
FIGURE 2. Indralaya Tanjung Senai pioneer train line plan
Source: own work.

Based on the "Study evaluating the usefulness of the Pioneer Train Lintas Kertapati – Indralaya" book, the railway line will be made from Indralaya Station – KPT Tanjung Senai can be seen in Figure 2. The planned train line will pass through some forests and swamps located on the edge of the Sriwijaya University.

Operational and maintenance costs on the Indralaya – Tanjung Senai rail road construction plan

In this study, operational and maintenance costs during the project life cycle (LCC) consist of railbus operational costs, infrastructure maintenance, operations and facility maintenance. Life cycle costs planned for 40 years consist of components that can be seen in Table 3.

If calculated manually between the cost of OM and the maximum number of passengers, then the minimum cost of passenger tickets is IDR 20,000 (rail road maintenance fee per year divided by the number of passengers per year).

TABLE 3. Components of rail road maintenance costs per year

Components	Annual cost [IDR]
Rail bus maintenance	366 680 020
Electrical costs	221 395 860
Personnel salaries	96 000 000
Track maintenance costs	1 406 080 000
Station maintenance	120 000 000
Total	2 210 155 880

Source: own work.

Refund/Revenue from ticket sales

Refunds on railway projects can come from passenger ticket payments, government subsidies, capital grants, and financing from private entities (Li & Love, 2020). The returns are only focused on profits resulting from passenger ticket sales. For passenger tickets, it is at IDR 3,000 per passenger. Based on the calculation results, the amount of revenue in the last five years of using Kertalaya trains can be seen in Table 4.

TABLE 4. Total revenue derived from passenger ticket sales for five years

Year	Number of passengers	Revenue IDR]
2015	27 343	82 029 000
2016	28 941	86 823 000
2017	32 968	98 904 000
2018	23 835	71 505 000
2019	20 842	62 526 000

Source: own work.

Based on Table 4 data, it can be concluded that it is not possible for the government to get a business entity that is willing to become a PPP partner in the development of the Kertalaya pioneer train project. Because the amount of income is smaller than the operational funds per year. Several Kertalaya train financing scenarios are needed, so that business entities become interested in investing in the development of the Kertalaya pioneer train project.

As an illustration, if the maximum passenger assumed at 70% of the maximum capacity of the train is met, and the passenger ticket price is increased to IDR 5,000 per passenger, then an income of IDR 783 million per year will be obtained. The income from this assumption is insufficient for the operational and maintenance costs of the Kertalaya train. There will also be fewer passengers on holidays (Saturdays, Sundays and other public holidays and sabbaticals).

Public-private partnerships scheme

Based on the data obtained above, it can be seen that income from tickets cannot cover operational and maintenance costs (Opex) at all. Based on the data from the Dinas Perhubungan Sumatera Selatan, in one year the Kertalaya only gets IDR 900 million for operational and maintenance funds. A strategy is needed that can make business entities want to invest by sharing scenarios for the distribution of responsibility between the government and business entities so that the construction of this route does not become a burden on the state budget – APBN (Lee et al., 2022). Because this rail road was only built as part of the existing length, so the focus scenario in this study is only on operational and maintenance costs (Opex) and the plan to add the Indralaya – Tanjung Senai rail line along 5.2 km.

Scenario 1: The government bears all Capex costs, while the Opex costs are fully borne by the business entity. In this scenario, the business entity has the right to determine passenger fares and has the right to manage and earn revenue from commercial areas both inside and outside the station, through sales, restaurants, cafes, and advertisements.

Scenario 2: The government bears Capex and maintenance costs, while business entities bear the costs of train operations and maintenance of both stations because they are related to tenant rent. Here an unbundling system is applied or a breakdown of Opex costs. In this scenario the tariff is determined by the government, but the business entity has the right to manage and earn revenue from commercial areas both inside and outside the station, through sales, restaurants, cafes, and advertising. The government stipulates that business entities can only charge a ticket price of IDR 5,000 per passenger, both for students, the public, and weekends.

Scenario 3: The government bears the Capex costs except for train procurement//revitalization, while the business entity bears the Opex costs and the government subsidizes the ticket price of IDR 10,000 per passenger.

In addition, revenue must be by maximizing commercial areas both inside and outside the station, through sales, restaurants, cafes, and advertising (Table 5).

TABLE 5. Public-private partnerships scenarios for pioneer trains

Cost component	Scenario 1	Scenario 2	Scenario 3
Income	Passenger ticketing and asset commercialization	Passenger ticketing and asset commercialization	Passenger ticketing and asset commercialization
Ticketing	Non subsidy	Government determined	Subsidy IDR 10 000 per passenger
Government support	Capex	Capex dan maintenance	Capex except the procurement/revitalise railbus
Entities responsibilities	Opex	Opex except maintenance	procurement/revitalise railbus and Opex

Source: own work.

Sensitivity analysis

The sensitivity analysis will consider the number of passengers heading to the Unsri campus and the number of passengers reaching the final station at the Tanjung Senai Office, as well as ticket prices. According to calculations, if 70% of passengers are students and 30% of passengers are employees at the Tanjung Senai office with a difference in fares for students of IDR 5,000 and IDR 10,000 for public and IDR 15,000 for holidays. The rate is increased by IDR 5,000 per five years as can be seen in Figure 3. The tariff increase is taken into consideration based on the increase in inflation in Indonesia, which in a year can reach 3.5%.

Based on the calculation results of sensitivity analysis, the values of the Capex, Opex and revenue for 40 years of life cycle cost, the revenue obtained from the commercialization assets is assumed about IDR 21 million per station per month. Based on the calculation results, the *NPV*
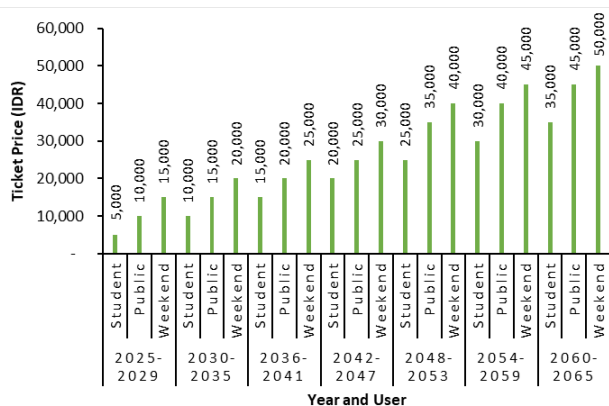

FIGURE 3. Planned ticket price increase
Source: own work.

value in 40 years with a discount of rate 15% can be seen in Figures 4 and 5, namely for Scenario 1 of IDR 185 million, for Scenario 2 of IDR 4.64 million and negative value of IDR 1.37 million for Scenario 3 (Table 6).
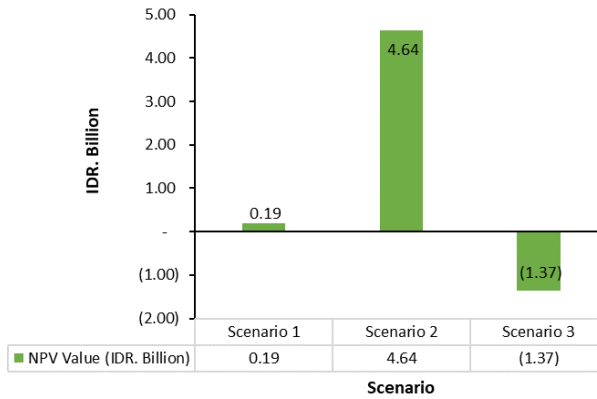

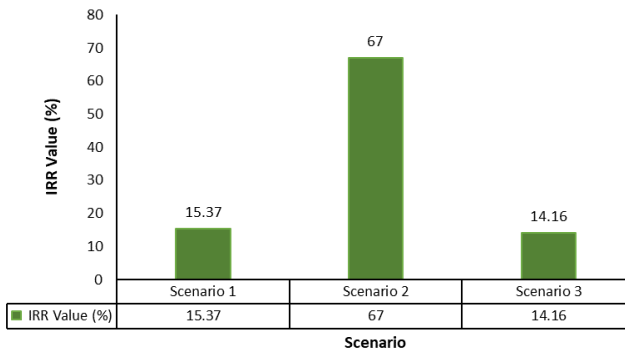FIGURE 4. *NPV* values for all three scenarios

Source: own work.

FIGURE 5. *IRR* values for all three scenarios

Source: own work.

TABLE 6. Recap of Capex, Opex and revenue values for 40 years from three scenarios

Variant	Capex	Opex	Revenue	Description
	million IDR			
Scenario 1	0	123 225.03	197 615.00	Capex borne by the government
Scenario 2	0	24 386.57	57 965.00	Capex and maintenance borne by the government
Scenario 3	8 847.00	123 225.03	308 275.00	The construction of rails is borne by the government

Source: own work.

Discussion

Existing conditions

The existing line of the Kertalaya pioneer train is 26 km long. If added again as planned to KPT Tanjung Senai, then 5.2 km will be added along. KPT Tanjung Senai is located in a less strategic position because it is not located on the edge of the main road. If you travel along the existing road, you must use a private vehicle, such as a motor such as motor rickshaw to go to KPT Tanjung Senai. The costs incurred are also high. In general, if one wants to visit KPT Tanjung Senai, people usually rent motor rickshaw, because these vehicles will also be used for people to exit again from the KPT Tanjung Senai Area. According to the preliminary survey conducted, it costs IDR 20,000–35,000 to rent a motor rickshaw to in and to out of KPT Indralaya. If someone departs from Kertapati to Indralaya by travel car, a fee of IDR 20,000 will be charged. Plus, the rental of a motor rickshaw of IDR 20,000 then an employee can spend money for travel costs of IDR 50,000–60,000 per day. Unsri students spend IDR 30,000 per day for a trip to the Indralaya campus. It is hoped that the Kertalaya train can reduce the travel costs of students and people going to KPT Tanjung Senai. Efficient use of capacity on railway infrastructure can result in cost savings for passengers (Ali et al., 2020). In addition, the use of trains is expected to reduce road congestion and road load Palembang – Indralaya and reduce traffic accident (Loo, 2019; Tao et al., 2021).

The condition of Kertalaya that has not been used for five years requires revitalization (Fig. 6). Revitalization here means improvement. The improvements to be implemented are also quite extensive. So, it requires special handling for repairs in order to operate optimally. Repairs can only be carried out at PT INKA Madiun, so the train must be sent back to its hometown.
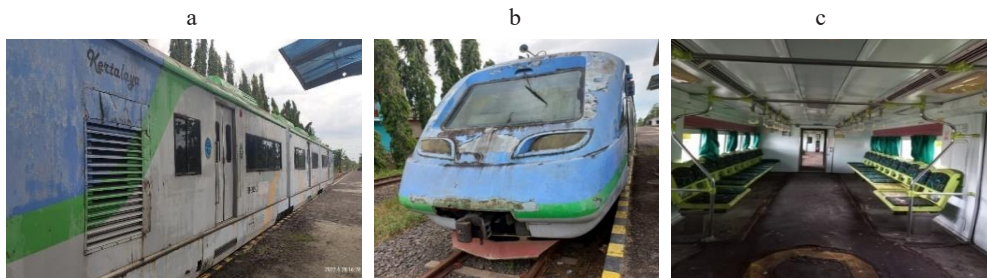

FIGURE 6. Interior (a and b) and exterior (c) damage to Kertalaya train
Source: own work.

Beside the exterior and interior of the train, damage also occurred to the train engine, train bogies, generators and motor traction, electrical panels, braking systems and air supply. According to information from the Department of Transportation, the cost of revitalizing the train is about IDR 18.3 billion.

Line construction financing plan and Indralaya train revitalization – KPT Tanjung Senai

Based on the calculation results in Table 2, the total cost of making a new rail road along 5.2 km is IDR 55.5 billion. The cost includes the construction of two bridges, each of which is planned with a span length of about 20 m, because the rail line is planned to be built through swamps and rivers, as well as the cost of crossing with roads. There are two crossings, located on the Indralaya – Prabumulih arterial road and the local road in Tanjung Pering Village. The location of the development plan is also within a swamp area and part of Unsri's forest. So, there are a lot of piles.

Operational costs and maintenance of Kertalaya train facilities and infrastructure

Kertalaya train operational and maintenance costs consist of railbus maintenance costs, fuel costs, personal salaries, track maintenance costs, and station maintenance costs. There are two units of station operational and maintenance costs, namely Indralaya station and Tanjung Senai station. The budget allocated is IDR 5 million per month per station. Personal salary costs of IDR 96 million per year are calculated by two people, with UMR salary. Railbus maintenance costs are calculated at 2% per annum of the cost of making rail roads (Berawi et al., 2014). Track maintenance costs are IDR 1.4 billion per year. So that the total operational and maintenance cost budget is IDR 2.2 billion in the initial 5 years. For the following years this cost is calculated to increase by 10% (Rahman et al., 2016; Love et al., 2017; Rahman et al., 2019). In the next five years, it will increase again by 10%. The increase in operational costs will be adjusted to the price of passenger ticket prices for the future.

Kertalaya train revenue

In accordance with applicable regulations, ticket sales are at IDR 3,000 per passenger. The results of passenger ticket sales for five years only range from IDR 60-90 million per year. Revenue from tickets is very less to cover operational

and maintenance costs on Kertalaya trains. In this study, an attempt was made to try and change the ticket price by increasing it to IDR 5,000 per student passenger and IDR 10,000 per general passenger and passengers on Saturday–Sunday. For general passengers who get off at Indralaya station still pay IDR 5,000. Unless passengers get off at Tanjung Senai station, passengers must pay IDR 10,000. General passengers who board from Indralaya station to Tanjung Senai station must pay IDR 5,000. This ticket price is valid for five years, namely from 2024–2029. For the next five years, ticket prices will be increased by IDR 5,000 each. So, the minimum payment is IDR 10,000. Until the final limit of life cycle costs calculated in this study, which is 40 years (Rahman et al., 2018, 2019). Ticket prices become a maximum of IDR 35,000, up to IDR 50,000. Details can be seen in Figure 2. Ticket price increases are not the only way. There must be creative ideas to bring profit to this project.

Previous studies have proposed several accreditives to increase income from scratch. One of them is by using land around rail roads or commercializing assets (Martín et al., 2014). There are also those who use the tax system for private vehicles that create congestion (Crozet, 2014; Emmanuel & Crozet, 2014; Xuto et al., 2022). Train financing in some countries of the world is financed by governments (Lowe, 2013; Jillella & Newman, 2016; Dehornoy, 2018). To reduce the burden on the state, it would be good if the government started involving business entities in making rail roads, train operations, and maintaining railway supporting facilities and infrastructure.

Utilization of assets around the station or commonly called asset commercialization can take place in the form of (Martín et al., 2014):
1. Creating minimarkets, coffee shops, and restaurants in the station area, both Indralaya station and Tanjung Senai station.
2. Working with the local government of Ogan Ilir to create tourist attractions in the Tanjung Senai area, so that the train can still operate on national holidays.
3. Providing places for advertising for tenants located at the station.

It is hoped that the use of land around the station can bring benefits that can cover operational and maintenance costs.

This research plans for each station to get a profit of around IDR 21 million per month, which comes from the benefits of renting space for tenants and advertisements, all of which are managed by Business Entities that work with tenants of food and other local products. so it can be calculated that the profit from the use of the two assets owned by PT KAI reaches IDR 500 million per year which will be included in non-ticket income (Rahman et al., 2018). The creation of a commercial area around this station can also be an attraction for prospective passengers, both general passengers and students.

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Especially for student passengers, there are several other things that can be done so that they want to use the train: (1) the train departure time must adjust to the student's lecture schedule, (2) there must be a mode of transportation (feeder) from Indralaya station to the Unsri campus for free, because the distance is a bit far to get to the Unsri campus, which is about 1.4 km and stops the operation of student buses.

After several scenarios for tariffs were made, *NPV* and *IRR* values were calculated as a result of government support (Tao et al., 2011; Rahman et al., 2016, 2018, 2019).

Kertalaya train operational financing scenario

Many scenarios can be made in funding PPP schemes. The distribution of investment costs, as well as operational and maintenance costs is carried out in order to obtain the same expected goals (Berawi et al., 2018, 2019, 2021).

In this study, three financing scenarios with PPP schemes for pioneer trains were proposed. The aim is to divide responsibility to Business Entities (Ismail, 2013; Wibowo & Alfen, 2015; Sun et al., 2017). In order to continue Kertalaya train operational, the business entity must always take care of the Kertalaya train. For this reason, the focus of this research is on how business entities manage and maintain Kertalaya trains. The Kertalaya train had to be overhauled after 10,000 hours of use. If used every day for two hours, then for seven years it must be overhauled so that the engine continues to run properly. So far, the overhaul costs have been carried out by the South Sumatra Provincial government. Due to cost constraints, the overhaul was not carried out, so the engine was damaged and the railbus could not be run. The application of the unbundling system was carried out in this study with the aim that Business Entities can benefit (Gangwar & Raghuram, 2015).

In Scenario 1, the business entity bears all maintenance and operational costs of the Kertalaya train, and the business entity also has the right to determine the price of passenger tickets, but still under the approval of PT. KAI as the manager. Business entities set ticket prices of IDR 5,000 for students, and IDR 10,000 for the general public. As for Saturday–Sunday, the ticket price is IDR 10,000 also per passenger. In this scheme, a discount value of 15% is used, calculated life cycle cost for 40 years (Berawi et al., 2018; Rahman et al., 2018; Berawi et al., 2021). The calculation results from Scenario 1 obtained an *NPV* value of IDR 185 million and an *IRR* value of 15.37. That means that this scenario is feasible and can be profitable for business entities.

In Scenario 2, the ticket price is equal for all students and the public, which is IDR 5,000, but the government bears the maintenance costs of both train overhaul

and rail road maintenance. This cost is IDR 1.7 billion per year, while the cost borne by the private sector is IDR 437 billion per year. In Scenario 2, the highest *NPV* value was obtained at 4.61 billion. So, it will be very profitable for business entities. This second scenario can be further developed, for example by shortening the concession period for business entities or by asking business entities to give back some of their profits to the government.

In Scenario 3, the government handed over train revitalization to business entities worth IDR 18 billion. The government will also subsidize ticket prices of IDR 10,000 per passenger, but passengers still pay according to Scenario 1. In this scenario, a negative *NPV* value of IDR 1 .36 billion and an *IRR* value of 14.16 were obtained. This means that the company's maximum discount only reaches 14.16% per year. This will certainly be difficult for business entities (Ali et al., 2016; Belal et al., 2020).

Based on the results of the analysis and calculation, Scenario 2 is most likely to attract business entities to invest, where business entities only fund the operational costs of pioneer trains and on the other hand, people who use trains will find it very helpful because of affordable fares. All scenarios use a 15% discount rate.

All scenarios include the commercialization value of assets as non-ticket income. Commercialized assets are obtained from advertising and land use around the station by business entities (Jillella & Newman, 2016). In this study, the average profit value from asset commercialization is IDR 20 million per month per station. Of course, this value can increase because of advertising, renting, and sales of food and beverage tenants around the station. If without commercialization of assets, then for scenario get an *IRR* value of IDR 2 million (negative), Scenario 2 get an *IRR* value of IDR 2 million (positive) and IDR 23 million (negative) for Scenario 3.

Based on the findings of this study, it was found that for pioneer trains, the government still has to intervene a lot in financing, this is because ticket prices cannot be too high set by business entities. In addition, it is also very important to cooperate with Unsri and parties in Ogan Ilir Regency so that the utilization of the Kertalaya train can run optimally.

Conclusions

The results of this study calculate the feasibility of financing Kertalaya pioneer trains. Based on the calculation results, the *NPV* value in 40 years is obtained with a discount of 15% for Scenario 1 of IDR 185 billion, for Scenario 2 of IDR 4.64 billion and a negative value of IDR 1.37 billion for Scenario 3. From this

research, it can be concluded that the role of the government is still very necessary for the feasibility of the Kertalaya pioneer train project plan. Other things that can be taken into consideration are the commercialization of assets and the system of solving responsibility (unbundling) and increasing ticket prices in order to cover train operating costs. To attract the interest of Unsri students and employees in Tanjung Senai, cooperation between business entities and the government is needed. Cooperation with the Department of Transportation to provide a mode of transportation that can transport students from the station to the campus. Another collaboration could take place with the Ogan Ilir Regency government in order to make the Tanjung Senai area more alive by creating recreation or tourism centers so that on Sundays and other holidays the Kertalaya train can still operate. This study has not considered the risk problems that will be faced with the unbundling system in the PPP scheme. It is hoped that this research can be a recommendation for funding other pioneer trains through the PPP scheme. Compared to similar studies, this study has differences in the form of the application of the unbundling system in the management of railway operational costs in the provincial city center and district city center.

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Summary

Public-private partnerships scheme of pioneer train case study in South Sumatera area. Pioneer trains in Indonesia have been fully funded by the government. The construction needs a lot of funding that would burden the state budget. One of the alternatives is the public-private partnership scheme. This study aims to analyze the most effective unbundling scenario for financing and maintaining the Indralaya-Tanjung Senai train. The life cycle costs and conducting sensitivity analysis according to applicable regulations. The scenarios are based on ticket price increases and government support for the operation and maintenance (O&M) for this pioneer train route, calculated net present value (*NPV*) and internal rate of return (*IRR*) value. Scenario 1 assumes that tickets do not receive subsidies; private companies are responsible for O&M costs. Scenario 2 assumes that ticket prices are set by private companies; the government is responsible for procurement and maintenance costs. Scenario 3 assumes that the government provides subsidies of IDR 10,000 per passenger as well as railway infrastructure; private companies bear the cost of procuring railbuses and operational expenses. Based on calculations with Scenario 1 *NPV* is IDR 0.73 billion; with Scenario 2, it is IDR 4.64 billion and with Scenario 3, it is IDR (–)1.34 billion. The analysis shows that increasing passenger fares according to price raises and inflation rates, and subsidies from governments for maintenance costs will make this railroad project financially feasible.