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Research article

Feasibility study on small cars as an alternative to conventional fleets due to low occupancy: case study in Indonesia

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A R T I C L E I N F O

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A B S T R A C T

Consumer interest in privately managed urban transport services in Indonesia are showing a declining trend. On the other hand, the presence of Transportation on Demand (ToD) based on Internet of Things (IoT) has attracted the majority of conventional fleet customers which contribute to the declining trend of occupancy. Therefore, this study aims to present a feasibility study of a small car RE60 Three Passenger and One Driver (3P+1D) four-wheeler as an alternative to replace conventional fleets. The Break-Even Point (*BEP*), Net Present Value (*NPV*), Internal Rate of Return (*IRR*), and Payback Period (*PP*) are analyzed based on vehicle operating data. The analysis shows that there is an additional monthly income flow of IDR 1,533,122 and IDR 2,536,946 from RE60 operations compared to the high and low consumption of fuel from existing fleets, respectively. In conclusion, it is feasible to invest in small car RE60 as a replacement for the existing fleets since the fundamental indicators (*BEP*, *NPV, IRR*, and *PP*) showed positive results before the specified instalment period. Sensitivity analysis also shows good results, NPV shows positive results (>0) although the input conditions are made pessimistic to -30% from NPV base case. The *BEP* of RE60 will cut distance travelled at 190,670 km and 115,225 km, respectively. *NPV* of IDR 33,088,000 and IDR 80,841,000 will be obtained at the 60th month after the operation and IRR also enabled good scores, at 2.24% and 4.17%.

1. Introduction

In recent decades, the phenomenon of urbanization has occurred in all cities around Indonesia. Congestion and air pollution in big cities have increased significantly. Meanwhile, the Government has not succeeded to implement clean and inexpensive modes of transportation, such as electric propulsion-based buses. In several cities such as Jakarta, Medan, Aceh, Semarang, Solo, Yogyakarta and several other cities, they have implemented a government-subsidized city transportation system. However, this practice has not seemingly provided public satisfaction [1, 2, 3, 4, 5]. In 2010, the presence of Transportation on Demand (ToD) based on Internet of Things (IoT) provided a new alternative to consumers.

Unfortunately, the presence of ToD based on IoT, especially Go-Car and Grab-Car caused concern to the urban public transportation business in Indonesia. Unscheduled public transportation operations of fleets dominated by old cars have to compete with Go-Car and Grab-Car which provide more comfort as well as competitive prices for consumers. The phenomenon of ToD or car-sharing has been operated in North America and Europe for so long [6, 7]. However, it has begun to be massively carried on in Indonesia since 2015. Go-Car and Grab-Car which were initially used in metropolitan cities in Indonesia such as Jakarta, Surabaya and Bandung, are now starting to reach out other small cities.

The ToD basic principle on IoT is a car-sharing in which people can get the benefit of using a private car without buying and paying the cost of car ownership [7]. On one hand, the availability of ToD provides new alternatives for consumers when conventional fleets' services are not reliable. For example, inaccuracies in schedules and routes due to congestion [8]. On the other hand, if the government does not intervene

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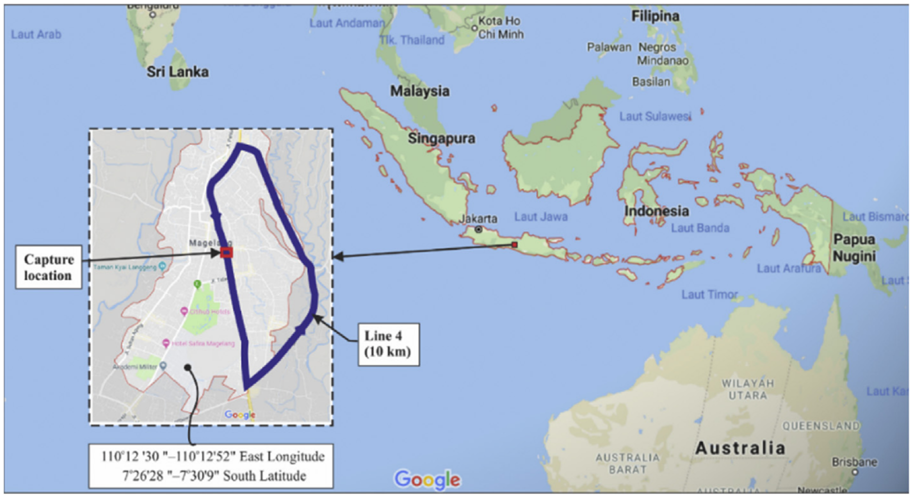

Figure 1. Line 4 and location for capturing conventional fleet occupancy (source: https://www.google.com/maps/@-7.4765465,110.2175953,18z).

through regulation, it will threaten the livelihoods of the conventional fleet's business operators. The benefits and risks of the ToD existence based on IoT have been discussed in detail from various point of views such as economic, social, and policy. Several solutions have also been proposed,m though it is difficult to achieve mutual justice [9, 10, 11, 12, 13].

In early 2016, thousands of crews and owners of conventional fleets held massive and simultaneous demonstrations in almost all major cities in Indonesia. Their income continued to decline due to passengers sharing with ToD. They demanded the government to create a regulation in which ToD must also fulfil the roadworthiness test from the Department of Transportation. In addition, they also requested ToD to be under the Legal Entity, not as private ownership, similar to the regulations for taxis and other public fleets. But at the end of 2016, many conventional taxis that were previously opposed to ToD, joined to the ToD business as they see more benefits. Until 2019, there is no exact data on the number of ToDs, but the number is estimated to reach more than 90,000 drivers [14].

Although the Government has issued policies through many discussion, conflicts between the conventional fleets and the ToD still continue, as reported by Wijayanto [15]. Government policies are still considered inequitable by the conventional fleet's driver, due to unfairness rates, areas of operation, vehicle administration, driving license, and the quality of the fleet. In fact, there is a significant disparity in the quality of the conventional fleets with the ToD fleets. Meanwhile, regenerating the conventional fleets with the new ones (vehicle retirement program) in a short term cannot be done by the Government due to economic factors though it has the opportunity to increase fleet occupancy and reduce emissions [16].

In Magelang, Central Java, for example, since the coming of ToD, conventional fleet's occupancy has continued to decline. We randomly did capture on lane 4, the busiest lane among the other 11 lanes. The capture was done on the main street of the city (https://www.google.com/maps/@-7.4765465,110.2175953,18z) in normal days (Figure 1). As a result, conventional fleet's occupancy was very low, as shown in Figure 2. We also conducted an observation by following a fleet that operates full day on lane 4, in 18 laps starting from 06.30 AM - 07.00 PM (12.5 h). The observation results indicated that the occupancy was very low, averaging under 30% of a maximum capacity of 12 passengers. The fleet owner got a share of IDR 90,000 (±USD 6.39) and the driver only

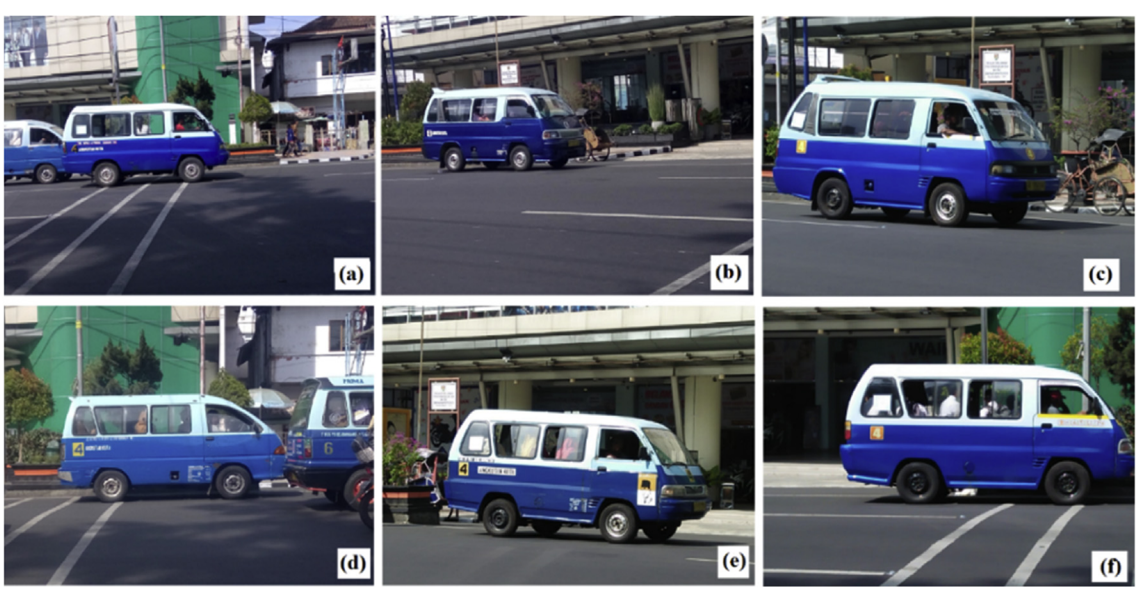

Figure 2. Capture of line 4 conventional fleet occupancy in Magelang City: (a) 2 passengers; (b) 1 passenger; (c) 1 passenger; (d) 4 passengers; (e) 4 Passengers; (f) 7 passengers (students who pay 50% of the normal fare).

Figure 3. Photographic view of small car Bajaj Qute RE60 (3P+1D) compared with conventional fleet.

got a wage of IDR 66,500 (±USD 4.76), the income was lower below 35.12% than the Magelang regional minimum wage in 2019 (IDR 102,500/± USD 7.24 per day in similar work hours). Moreover, the conventional fleets in Magelang are owned by individuals or co-operatives in which drivers must pay the rent fleets to the owners with daily rent around IDR 90,000 – IDR 100,000.

In the previous study [17, 18, 19], we have conducted a simulation of the possibility to replace gasoline with LPG for conventional fleets in Magelang in order to increase the income of the crews and improve passenger services. As a result, it was both economically feasible and technically challenging since the conventional fleets in Magelang City are dominated by old vehicles (made before 2005). In the present time, although the Government through Pertamina (a state-owned corporation) has provided LPG dispensers in Magelang, it still requires significant pre-conversion costs so that the risk of failure can be minimized [20]. In addition, there must be a conversion funding plan that involves cost-sharing between fleet owners, the government, and even CSR from state-owned corporations.

As a solution, the use of a small car Bajaj Qute RE60 4-wheel capacity of 217 cc (Figure 3) with 3 passengers +1 driver (3P+1D) is a reasonable alternative to replace the existing fleet (1000–1300 cc). Bajaj RE60 cc, both 3 wheels and 4 wheels have been widely used in some countries in South Asia and Southeast Asia, including Indonesia. With smaller engine volumes, there is a significant potential for fuel savings and exhaust emissions' reduction [21, 22, 23]. In India, the use of Bajaj Qute RE60 was also reported to provide employment opportunities for local youth. The car is purchased through a bank loan so that it could bridge the gap between urban and rural transportation modes shortly [24]. Bajaj Qute RE60 for public transportation in Indonesia has been operated in Jakarta since 2016, showing a good consumer acceptance. Meanwhile, other regions across Asia operate Bajaj Qute RE60 in different ways and policies. But, in general, they are rented. Therefore, based on the identified problems and available opportunities, this article is aimed to present a feasibility study on the use of Bajaj Qute RE60 to replace conventional fleets, which operates on the existing lane, especially in Magelang, Indonesia.

Table 1. Specification of RE60 small car [25].

Item		Specification
Engine	:	217cc Petrol
Transmission	:	Constant Mesh Manual
	:	5 Forward
	:	1 Reverse
Max speed	:	70 kmph
Kerb weight	:	399 kg
Seating capacity	:	Driver +3
Length	:	2752 mm
Width	:	1312 mm
Height	:	1652 mm
Wheel base	:	1925 mm
Wheel track	:	1143 mm
Ground clearance	:	180 mm - unladen
Turning circle radius	:	3.5 Meter

2. Method

2.1. Vehicle specification

The Bajaj Qute RE60 small car specifications used in this study are presented in Table 1. Furthermore, the main features of the car can be seen in the brochure provided by the manufacturing company [25].

2.2. Fuel consumption testing

The fuel consumption test was carried out using the full to full fuel tank method where the Bajaj RE60 followed the conventional fleet on track 4 as presented in Figure 1. Each car was given 4 passengers, including the driver. The two cars departed from the fuel station in the same position with full tanks and then operated for 5 rounds which covered a total distance of 49.5 km. After completing 5 turns, both vehicles returned to the fuel station to be fully refilled. Finally, the fuel consumptions of the two cars were compared.

2.3. Feasibility analysis

After fuel consumption could be estimated, a Break-Even Point (*BEP*) analysis was conducted to determine the minimum mileage for covering the investment cost to purchase the RE60 unit considering the salvage value of the old fleet. *BEP* for mileage was calculated using Eq. (1).

$$BEP = \frac{I_0}{(RC_{ef} - RC_{RE60})} \tag{1}$$

Where, I_0 is the initial investment (price of the new RE60 - salvage value of the old fleet), RC_{ef} and RC_{NRE60} are running costs of existing fleets and new fleets (Bajaj Qute RE60), respectively.

To assess investment feasibility, this study used a Net Present Value (*NPV*), an Internal Rate of Return (*IRR*), and Payback Period (*PP*). *NPV* was discounted based on investment costs, while IRR was the interest rate that would make the present value of the expected results be received. This program was considered feasible if $NPV > 0$ and *IRR* were greater than bank interest. In this analysis, additional net monthly income was calculated from the difference in running costs between RE60 and conventional fleet. Then, *NPV* was calculated using Eq. (2).

$$NPV = \left[\frac{\pi \times [1 - (1+i)^{-n}]}{i}\right] + \left[\frac{S}{(1+i)^n}\right] - I_0 \tag{2}$$

where, π is savings per month, i is the bank interest, n is the installment period to the bank, and S is the estimated salvage value of RE60 in the 60th month.

Then, Payback Period (PP) was calculated to assess the period for recovering investment costs with net cash flow (Eq. 3). The sooner the *PP* is reached, the more promising this program will be implemented.

$$PP = \frac{I_0}{\pi} \tag{3}$$

3. Result and discussion

3.1. Operation data

Line 4 covers a distance of ±10 km in each lap as presented in Figure 1. We conducted a simulation with 4 passengers, both for

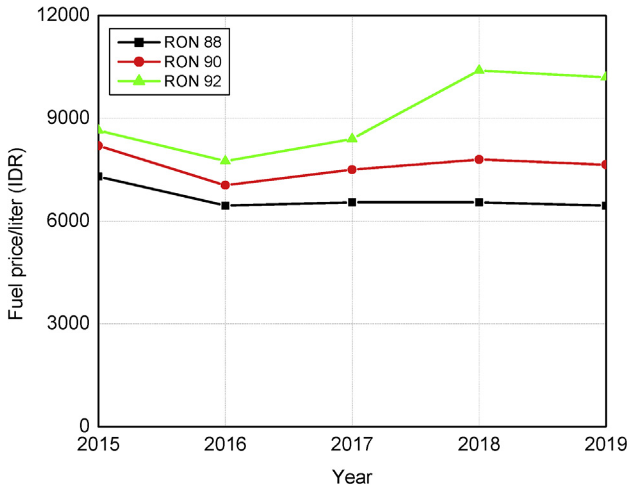

Figure 4. Fuel price historical data in Indonesia, 2015–2019 [26].

conventional fleets and for small cars RE60. Conventional and RE60 fleets were operated regarding to the traffic conditions without intervention and comply with city speed standards, including adherence to signs and traffic light. Two vehicles travelled 49.5 km at an average speed of 24 km/h and maximum speed of 66 km/h. Fuel consumption for both vehicles with RON 90 (pertalite) fuel were 3.66 L for conventional fleets (Daihatsu Zebra 1000 cc) and 1.96 L for RE60. After a conversion, both fuel consumptions were 13.25 and 25.25 km/L for conventional fleet and RE60, respectively. The fuel consumption of the conventional fleet can be more wasteful if the engine used is 1300 cc or if it is lack of maintenance. With an assumption that the fleet operates 18 laps and takes a distance of approximately 180 km/day, and the price of RON 90 is IDR 7650 (the price of fuel at the end of 2019), the fuel costs for conventional fleet and RE60 are estimated of IDR 100,800/day and IDR 54,000/day, respectively. This means that there is a potential saving of IDR 46,800/day or IDR 260/km on the use of RE60. For information, RON 90 prices in Indonesia fluctuated during 2015–2019, but there were no significant changes as presented in Figure 4.

The savings will be even greater when compared to the conventional fleets with fuel consumption of 10 km/L (like the most conventional fleets that have been operated, based on the interviews with the drivers through Focus Group Discussion-FGD). If this condition is used as a comparison, with a distance of 180 km/day, then there is a saving of IDR. 84,105/day or IDR. 467.25/km, which is a significant amount of consideration to move from a conventional fleet to a 3P+1D small car.

3.2. Economics analysis

Economic analysis was carried out based on 4 main components; Break-Even Point (BEP), Net Present Value (NPV), an Internal Rate of Return (IRR), and Payback Period (PP). First, we estimated the BEP based on operational data obtained from observations. Annual mileage was estimated with an average daily operation, 180 km/day and 28 days per month. RE60 with fuel consumption of 25.25 km/L compared to 2 conventional fleet conditions, cars with low fuel consumption (13.52 km/L) and cars with high fuel consumption (10 km/L).

Annual maintenance costs were obtained through interviews with drivers and staff of the Department of Transportation, Magelang city, based on their experience. Meanwhile, the Bajaj Qute RE60 maintenance cost data was obtained through personal communication with the Manager of PT Megalestari Mobilindo, who has had an experience operating the Bajaj Qute RE60 in Jakarta, Indonesia. Salvage value of the existing fleet was estimated at IDR 15,000,000 (the lowest possible price) and an on the road price of the new Bajaj Qute RE60 of IDR 73,000,000 (based on the brochures from the distributors). Operational data for potential annual saving and *BEP* calculations are given in Table 2. Next, the linear curve of distance travelled and running costs, as well as the *BEP* intersection point is presented in Figure 5 and the data is presented in Table 3.

Table 2. Operational data for annual saving calculation and *BEP*.

Parameters	Value	Unit	Formula
Mileages per year	60,480.00	km	vm
Fuel consumption of existing fleet (low fuel consumption)	13.52	km/l	Fc_{efl}
Fuel consumption of existing fleet (high fuel consumption)	10.00	km/l	Fc_{efh}
Fuel consumption of RE60	25.25	km/l	Fc_{RE60}
Gasoline RON 90 price/liter	7,650.00	IDR	C_g
Annual fuel cost for existing fleet (low fuel consumption)	34,221,301.78	IDR	$C_{efl,a} = \frac{vm}{Fc_{efl}} \cdot C_g$
Annual fuel cost for existing fleet (high fuel consumption)	46,267,200.00	IDR	$C_{efh,a} = \frac{vm}{Fc_{efh}} \cdot C_g$
Annual fuel cost for RE60	18,323,643.56	IDR	$C_{RE60,a} = \frac{vm}{Fc_{RE60}} \cdot C_g$
Annual saving RE60 to existing fleet (low fuel consumption)	15,897,658.21	IDR	$\pi_{RE60-efl} = C_{RE60,a} - C_{efl,a}$
Annual saving RE60 to existing fleet (high fuel consumption)	27,943,556.44	IDR	$\pi_{RE60-efh} = C_{RE60,a} - C_{efh,a}$
Capital cost for RE60 ownership	73,000,000.00	IDR	C_{RE60}
Salvage value of existing fleet, estimated	15,000,000.00	IDR	S_{ef}
Total capital cost for RE60 ownership	58,000,000.00	IDR	I_0
Annual maintenance cost for existing fleet (include tax), estimated	6,014,400.00	IDR	C_{mef}
Annual maintenance cost for RE60 (include tax), estimated	3,514,600.00	IDR	C_{mRE60}
Running cost/km for existing fleet (low fuel consumption)	665.27	IDR	$RC_{efl} = \frac{(C_{efl,a} + C_{mef})}{vm}$
Running cost/km for existing fleet (high fuel consumption)	864.44	IDR	$RC_{efh} = \frac{(C_{efh,a} + C_{mef})}{vm}$
Running cost/km for RE60	361.08	IDR	$RC_{RE60} = \frac{(C_{RE60,a} + C_{mRE60})}{vm}$
BEP RE60 to existing fleet (low fuel consumption)	190,669.82	km	$BEP_{RE60\ to\ efl} = \frac{I_0}{(RC_{efl} - RC_{RE60})}$
BEP RE60 to existing fleet (high fuel consumption)	115,225.14	km	$BEP_{RE60\ to\ efh} = \frac{I_0}{(RC_{efh} - RC_{RE60})}$

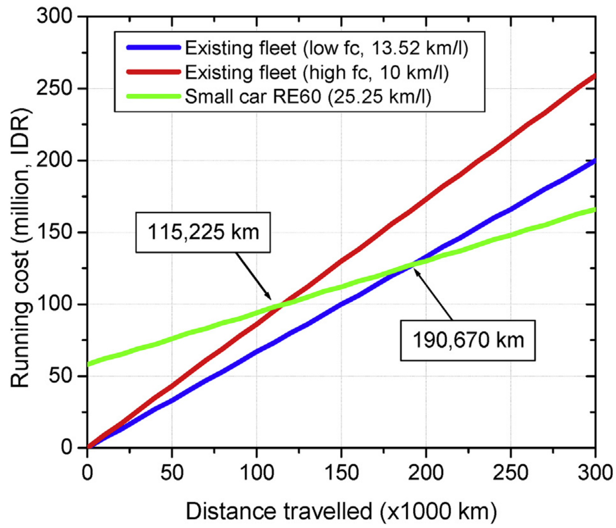

Figure 5. Estimated of distance travelled - running costs - *BEP* intersection point.

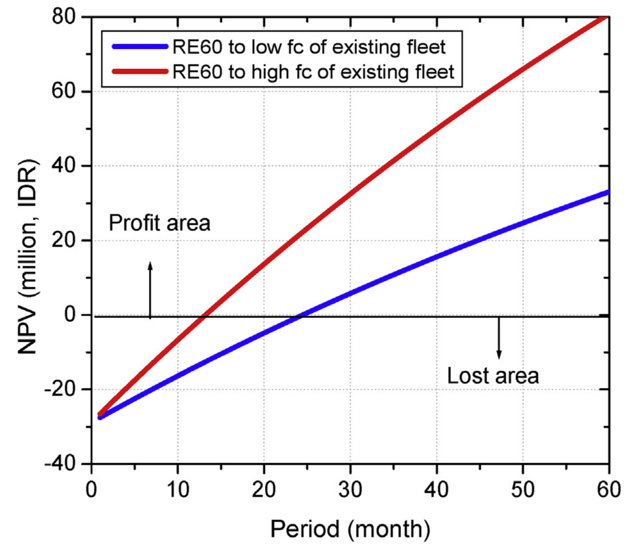

Figure 6. *NPV* curve of RE60 investment compared to the two existing fleet conditions.

Where, *BEP* will cut distance travelled at 190,670 km and 115,225 km for conventional fleets with low fuel consumption (13.52 km/l) and high fuel consumption (10 km/l), respectively. The *BEP* of Bajaj Qute RE60 will be faster if compared to conventional fleet with more fuel for each laps.

Second, after the difference in operational costs was obtained, the analysis was continued by estimating the *NPV*. Prospective owners of RE60 must invest at least IDR. 58,000,000 obtained from the new Bajaj Qute RE60 price (IDR 73,000,000) minus the salvage value of the existing fleet (IDR 15,000,000). The bank interest rate used in this analysis was 0.8% per month, according to the amount issued by Financial Services Authority on May 2019, the highest prime lending rate was 14.50% p.a. for corporate credit. Meanwhile, the general interest rate was 9.54% p.a., the average of all banks in Indonesia [27].

We consider the salvage value of RE60 at the end of the fifth year (60th month) with a depreciation calculator for the car given by OMNI [28]. It was assumed that the operational life of RE60 was in 10 years, but in this study it is considered to be 5 years. With the new price RE60 is IDR 73,000,000 obtained in the fifth year salvage value is IDR 29,200,000. From the calculation results, an *NPV* of IDR 33,088,000 and IDR 80,841, 000 for the low and high fuel consumption scenario of the existing fleet. *NPV* curves with two conventional fleet fuel consumption scenarios are presented in Figure 6 and the data is presented in Table 4.

Third, *IRR* was calculated to see whether this investment is feasible or not. *IRR* which is greater than the bank interest guarantees that this investment is reasonable. From Table 2, the additional monthly profit (π) of RE60 operational compared to existing fleet is IDR 1,533,122 and IDR 2,536,946 for high and low consumption fuel of existing fleets, respectively. Based on IRR simulation, the replacement of existing fleets in small car RE60 by bank's loan is feasible. IRR curve with capital cost of IDR 58,000,000 and the bank interest of 1% per month is presented in Figure 7 and the data is presented in Table 5.

To see how long this investment would return, a calculation of the Payback Period (PP) was given. Initially, the financial position is considered a debt of IDR. 58,000,000 for two conditions. As time goes by, the owner of RE60 will receive an accumulative proceed until the capital costs have passed. The Investment in replacing public transports from low and high fuel consumption fleet to RE60 will receive a payback period at the 46th and 26th months, respectively. We have calculated PP with available data and the result is presented in Figure 8 and the data is presented in Table 6.

Finally, a sensitivity analysis is used to measure changes in NPV if there are changes in key indicators that affect project appraisal, which include mileage per year, fuel consumption of RE60, price of gasoline RON 90/liter, capital cost ownership for RE60 (considering salvage value of existing fleet), and annual maintenance cost for RE60. In this sensitivity analysis, we use NPV RE60 for the low fuel consumption of existing fleet, which is more vulnerable than the high fuel consumption of the existing fleet. RON 90 prices in Indonesia fluctuated during 2015–2019, but there were no significant changes, even a decline from 2018 to 2019 (see Figure 4). Therefore, in this sensitivity analysis, we use optimistic and pessimistic figures of up to 30% from the NPV base case. A pessimistic condition is assumed to be +15% and +30% of NPV base case and optimistic conditions are assumed to be -15% and -30% of NPV base case. This assumption is higher than the historical data of RON 90/liter gasoline price which has decreased by 7% in the last 5 years. As a result, the

Table 3. Data for distance travelled - running costs - *BEP* intersection point.

Distance travelled (x1000 km)	Running Costs (million)			Saving to low fc existing fleet (million)	Saving to high fc existing fleet (million)
	existing fleet (low fc, 13.7 km/l)	existing fleet (high fc, 10 km/l)	Small car RE60 (25.58 km/l)		
0	0.00	0.00	58.00	-58.00	-58.00
50	33.26	43.22	76.05	-42.79	-32.83
100	66.53	86.44	94.11	-27.58	-7.66
150	99.79	129.67	112.16	-12.37	17.50
200	133.05	172.89	130.22	2.84	42.67
250	166.32	216.11	148.27	18.05	67.84
300	199.58	259.33	166.32	33.26	93.01

Table 4. Net Present Value (*NPV*) data.

Month	DF of π	DF of S	*NPV* of RE60 to existing fleet, (million, IDR)	
			RE60 to low fc of existing fleet	RE60 to high fc of existing fleet
1	0.99	1.01	-27.51	-26.51
10	9.58	1.08	-16.34	-6.73
20	18.42	1.17	-4.83	13.66
30	26.60	1.27	5.80	32.50
40	34.15	1.37	15.63	49.91
50	41.13	1.49	24.70	65.99
60	47.57	1.61	33.09	80.84

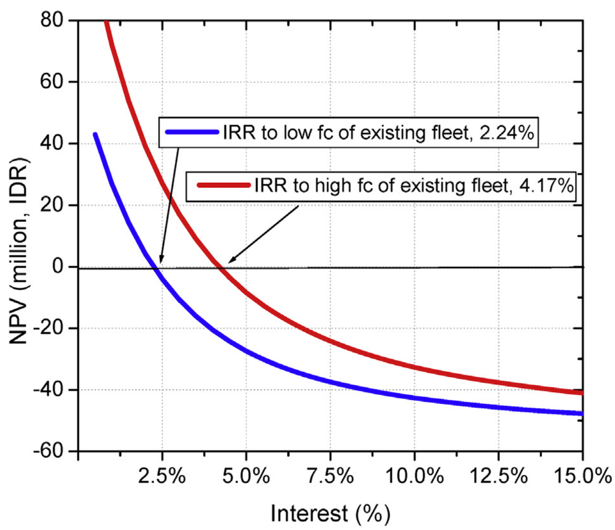

Figure 7. *IRR* curve of RE60 investment compared to the two existing fleet conditions.

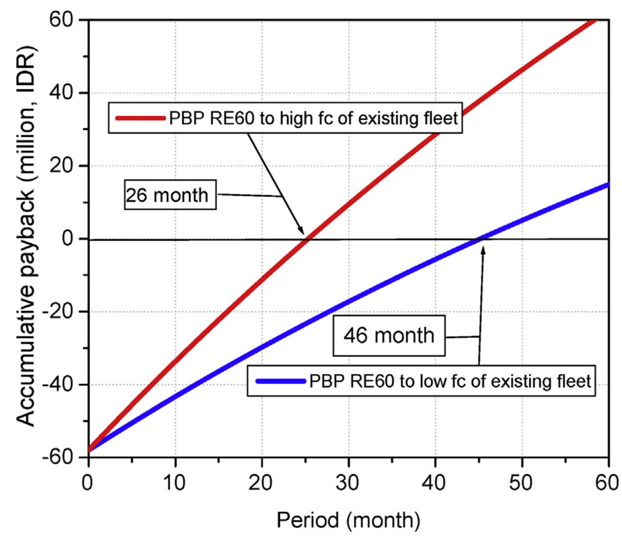

Figure 8. Payback period curve of RE60 investment compared to the two existing fleet conditions.

NPV shows a positive result (>0) even though the input conditions are made pessimistic to 30% as shown in Figure 9.

The results of the *BEP, NPV, IRR,* and *PP* as well as sensitivity analysis calculations all indicated a decent investment. With an assumption that additional monthly income is entirely used to pay instalments to the bank, drivers and owners will receive the fastest benefit share in the 26th month. However, the Regional Government can provide various kinds of incentives so that drivers can enjoy the benefits as soon as the new fleet operates. Incentives can be given in the form of direct subsidies to drivers until bank instalments are completed or by providing interest-free loans to fleet owners.

Furthermore, the profitability of using Bajaj Qute RE60 will be better if it uses more efficient and cleaner fuels such as LPG and CNG [29]. LPG is technically easier to apply because fuel stations in several cities in Indonesia are equipped with LPG dispensers. For CNG, which is cheaper than LPG, it needs full support from the Government to build inter-city CNG infrastructure and networks. Informed by Bajaj, the latest version of RE60 has used an electric propulsion system [30]. Of course, this electric-based vehicle will be more profitable operationally, even with various disadvantages, such as in power and limited mileage. In addition, the adoption of electric-based vehicles is also very dependent on the seriousness of the Government and the readiness of consumers. Therefore, the top-down system is considered more effective than the bottom-up system [31], which begins with the provision of policies and infrastructure, policy simulations and risk mitigation, and education to consumers.

4. Conclusion

From the economic analysis, it can be concluded that investing in the small car Bajaj Qute RE60 as a replacement for the existing fleet is feasible. All fundamental indicators such as Break-Even Point (*BEP*), Net Present Value (*NPV*), Internal Rate of Return (*IRR*), and Payback Period (*PP*) showed positive results before the specified instalment period. Sensitivity analysis also shows good results, NPV shows positive results (>0) although the input conditions are made pessimistic to -30% from

Table 5. Internal Rate of Return (*IRR*) data.

Interest rate	IRR to low fc of existing fleet (million, IDR)	IRR to high fc of existing fleet (million, IDR)
0.5%	61.18	113.10
2.5%	6.91	37.94
5.0%	-20.75	-1.74
7.5%	-32.81	-19.60
10.0%	-39.11	-29.11
12.5%	-42.90	-34.88
15.0%	-45.43	-38.74

Table 6. Payback Period (PP) data.

Month	Proceed Accumulative (million, IDR)		PBP RE60 to low fc of existing fleet (million, IDR)	PBP RE60 to high fc of existing fleet (million, IDR)
	RE60 to low fc of existing fleet	RE60 to high fc of existing fleet		
0	0	0	-58.00	-58.00
10	14,68	24,29	-43.32	-33.71
20	28,24	46,74	-29.75	-11.26
30	40,78	67,48	-17.22	9.48
40	52,35	86,63	-5.65	28.63
50	63,05	104,33	5.05	46.33
60	72,93	120,68	14.93	62.68

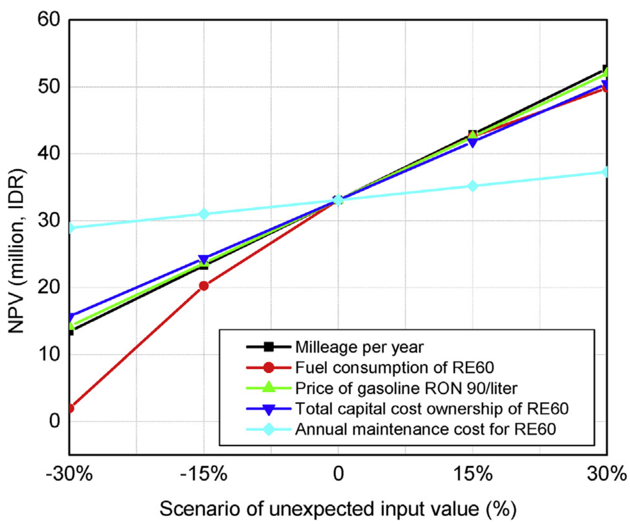

Figure 9. Plot of sensitivity analysis.

NPV base case. Compared to the existing conventional fleet with low fuel consumption (10 km/l) and high (13.52 km/l), the *BEP* of Bajaj Qute RE60 will cut distance travelled at 190,670 km and 115,225 km, respectively. *NPV* of IDR 33,088,000 and IDR 80,841,000 will be obtained at the 60th month after the operation. IRR also enabled good scores, at 2.24% and 4.17%. If all parameters have not changed, the payback period will be accepted at the 46th and 26th months. Those indicators can be better if the monthly income flow is greater. It is obtained from the difference in running costs between RE60 and the existing fleet. The government can also provide subsidies for this transition program, or at least provide special bank interest so that all fundamental indicators are safe and resilient to the changes of input values.

Declarations

Author contribution statement

Muji Setiyo: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Eko Muh Widodo: Conceived and designed the experiments; Wrote the paper.

Muhammad Imron Rosyidi: Performed the experiments; Analyzed and interpreted the data.

Budi Waluyo, Zulfikar Bagus Pambuko & Norrefendy Tamaldin: Analyzed and interpreted the data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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