The Financial Evaluation of Transportation Project In Malaysia: A Case Study of Putrajaya Monorail Transit System

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***Abstract*-This paper explores a financial evaluation of the proposed transportation project of the Putrajaya Transit System Line 1 (PMT1) in term of investment return to the concessionaire. One of the key elements in the planning of Putrajaya is to provide an efficient transportation system befitting a city design for the 21st century. The formation of transportation strategy has to be undertaken with a view to satisfying as far as possible, free of congestion and has minimal levels of air and noise pollution. In relation to this, most of the concessionaires are ambivalent about assessing the worth of investment return with regards to infrastructure project because of the multi-faceted issues involved in evaluation of such investment. Thus, an adjusted financial evaluation is introduced with application of Discounted Cash Flow (DCF), Net Present Value (NPV) and Internal Rate of Return (IRR) as main tools to evaluate the project. This approach is applied to prove the financial viability and feasibility of PMT1 project according to respective proposed business plan. Therefore, the concessionaire is able to evaluate the profitability and the possibility of investing in this type of concession project.**

Keywords: financial evaluation; transportation project; investment return; viability

I. INTRODUCTION

Putrajaya has been planned as national administrative centre and to place all Federal Government administrative departments and agencies away from Kuala Lumpur City Centre. The transfer process has been started in 1999 and expected to complete by year 2011 or 2012. Unfortunately, in this process, the private sector seems to be ignored in the planning. The dominance of ministries, departments and agencies in urban economics are still unable to create a multiplier effect to the economy of the city, without the present of private sectors to operate their business in Putrajaya. The economic activities in Putrajaya are mostly focus on providing facilities to the local people such as retails and restaurants. Nevertheless, among the non-government economic activities, tourism has a great potential to grow if a well-structured promotion is being laid.

This paper presents the findings from the study done on the proposed development that involves the construction of Putrajaya Monorail Transit System Line 1 (PMT1). This development project is proposed to provide an affordable and convenient public transport service for the residents in Putrajaya, specifically for the purpose of travelling between workplace and home. The study is done to determine the business value of the operation of monorail services and, the investment return to the developer as well as to evaluate the financial viability for the development of PMT1 in Putrajaya.

II. CONCESSION DETAILS

The Concession Company (CC) is proposing to own the rights to the Concession (Lease – Operate – Transfer (LOT)), of PTM1 from the Precinct 9 station to the Precinct 14 station, from Perbadanan Putrajaya which acts as the local authority of the Federal Territory of Putrajaya. The concession period is expected to last for 30 years starting from 1st January 2010. The CC will only have the right to operate the business and not involve in any construction or upgrading of the stations and guideways.

Table Ⅰ: Summary of Concession

Name of Project	Putrajaya Monorail Transit System Line 1 (PMT1)
Location	Federal Territory of Putrajaya
Local Authority	Perbadanan Putrajaya
Concession Period	30 years
Type of Concession	Lease – operate – transfer
Operator's Benefits	• Revenue from stations • Guideway provided by local authority • Stations provided by local authority • Long concession period • Exemption of corporate tax • Air rights to operate business
Local Authority's Return	• An alternative public transport system in Putrajaya • Payment of lease of guideway and stations by Operator • The transfer of the business by Operator to Local Authority after LOT ends.
Length of Line	13.6 km
Number of Stations	Total : 18 stations 10 elevated stations (Station 1-6,15-18) 7 underground stations (Station 7-13) 1 at-grade station (Station 14)
Number of Trains	18 units (to be leased from ALWEG Corporation, Germany)
Current Status of Project (March 2009)	60% completion

III. INTEGRATED TRANSPORTATION PLANNING

One of the key elements in the planning of Putrajaya is to provide an efficient and effective transportation system befitting a city design for the 21st Century. The formulation of transport strategy has to be undertaken with a view to satisfying certain main goals and objectives as follows:

- To provide an attractive build environment that is, as far as possible, free of congestion and has minimal levels of air and noise pollution.
- To maximise the use of non-polluting forms of transport.
- To provide a clear road network hierarchy in and around Putrajaya, and to provide adequate links to the existing and planned future regional road networks.
- To give priority to public transport [based on a 30% and 70% split between private and public transport].
- To provide an efficient integration between the various public transport modes.
- To promote 'park-and-ride' concept to encourage driver to park on the periphery of the core areas and use public transport for trips within the core areas.
- To ensure that the transport networks are sufficiently flexible to cater for alternative phasing needs that may arise in the future

The transportation system for Putrajaya has been developed around the integrated city. Public transportation system (bus and monorail) complemented by a well designed and efficient highway network and water transport modes serving for recreational purpose. The transportation activities is granted 18% of the total land use planning which are the second highest land use allocation in Putrajaya.

IV. PROPOSED DEVELOPMENT

In this proposed development of PMT1, the government will provide the rails, tracks and stations of the monorails; therefore, CC will only lease the train from ALWEG Corporation, Germany and operate for thirty (30) years. After thirty years of operation, CC will transfer the business to Perbadanan Putrajaya.

The basic tenet of the Putrajaya transportation master planning philosophy is to promote the use of public transport within the city centre by minimising reliance on the private vehicles, thus avoiding socio-economic and environmental adverse impacts attributed to traffic congestion. Therefore, the proposed development, Putrajaya Monorail Transit System (PMT1) will be the main public mode of transportation.

PMT1 will form the backbone of Putrajaya Monorail System. Line 1 starts in Precinct 9 on the northwest and terminates in Precinct 14 on the northeast. The total length of Line 1 is about 13.2 kilometres and there will be 18 stations along the line. Line 1 will directly serve Precincts 9, 7, 8, 4, 3, 2, 1, 15 and 14. It is the main line serving the Government precincts in the Core Island with residential and other commercial precincts on the west and north (Figure 1).

Figure 1. Alignment of PMT1

A. *Development Concept*

The concepts of development are based on safe, affordable and efficient transportation, reducing pollution and congestion and create an environmental friendly transportation system. These concepts of development fulfil the public transport strategy adopted by Putrajaya, which includes:

i. Achieving a target of 70% of all travel to the core precincts to be made public transport;

ii. Adopting a seamless transportation system that integrates the various modes of external and internal transport system to provide a seamless journey from the peripheral precincts into the city centre;

iii. Promoting a rail-based public transport system that is reliable, quiet and environmental friendly;

iv. Providing good support facilities to allow efficient interchange between all modes;

v. Providing strategically-placed park and ride facilities to encourage use of the public transport system;

vi. Providing efficient and reliable bus and feeder bus service network within Putrajaya;

vii. Promoting efficient and reliable express and commuter rail and bus services form external areas, namely, Kuala Lumpur, KLIA and the rest of Klang Valley.

Conceptually, the planning and design of the eighteen stations complies with the following requirements of Putrajaya Perbadanan's Transport Master Plan, namely to provide:

i. Sheltered approaches for pedestrians;

ii. Lifts and escalators to facilitate change in level;

iii. Adjacent bus stops, taxi ranks and private car drop-off/ pick-up points for service integration and passenger interfacing;

iv. A comprehensive passenger information system on bus and monorail services;

v. Facilities for the disabled at the station entrance, concourse and platforms;

vi. Local car parking area.

The proposed development is a kind of a sustainable development that includes social, economic and environmental objectives that are:

- Socially desirable, fulfilling people's cultural, material and spiritual needs in equitable ways,
- Economically viable, paying for itself, with costs not exceeding income, and

- Environmentally sustainable, reducing pollution and creating quiet neighbourhood

V. SWOT ANALYSIS

Table Ⅴ. SWOT Analysis of Proposed Development

Strength	**Weakness**
• The first and only one rail transportation in city. • Reduce possibility of traffic congestion within the city. • Ticket price is affordable for consumers; RM 1.20, RM 1.60, RM 2.10, RM 2.50 and RM 3.20 according to the length of travels. • Faster, easier and convenient to move around in the city and across boundaries with the interchange of ERL, buses and taxis. • Increase quality of life where families can share quality time together as the family members will not need to be trapped in traffic congestion with the usage of monorail service. • All the location is strategic and good whereby the demand is mainly from the government servants.	• The cost to manage and maintain the monorail system and stations is high as the trains are imported from overseas. • As this is a social welfare service, the ticketing fare is fixed and regulated by government. The profit will be lowered down. • High rate of self-owned vehicles in Putrajaya.
Opportunities	**Threat**
• Spending quality time with family is encouraged by Malaysia government to the public. As most of the consumers are expected to be government servants, consumption of monorail will be optimistic. • The public transports in Putrajaya are reliant on each other; therefore the usage of monorail is expected to be high. • Land in Putrajaya is mostly government land, which is suitable for future extension of monorail. • Introduce a new type of public transport mode which symbolise Putrajaya as a modern city.	• Population will face slow growth after all the government ministries, departments and agencies settle down in Putrajaya in 2012. • The trains will create sound pollution to the neighbourhood of the monorail system.

A. PROJECT EVALUATION

Based on the studies and analysis done on the supply and the demand of monorail and also the social-economy studies in the area of Perbadanan Putrajaya, we can conclude that this location has the potential to develop a monorail line which connects Precinct 9 to Precinct 14. This area is also expected to experience growth in terms of population and economy in the future. Moreover, based on our analysis, we found that this area is also a focus of government department office, commercial and residential which is experiencing growth.

This proposal is strengthen through the analysis of transportation and traffic flow which was done in the area of study. The proposed development of the monorail route in this area is expected to help sustain non-pollution environmental. This advantage is predicted to transform the mode of transportation used by the residents to monorail transportation.

B. PROPOSED BUSINESS PLANS

This paper proposes two types of alternatives on how CC can run the concession. The first alternative, which will be referred to as Business Plan A, would require the CC to pay for the expenses to install the 13.6 km long track on the guideway, and for the purchasing of 18 units of trains. The ticket fares would be at a higher rate than Business Plan B due to its excessive costs and higher payment of loan.

Another alternative, which will be referred to as Business Plan B, would not require CC to pay for the expenses for the installation of tracks and purchasing of trains. Instead, CC would only have to operate the business, and expenses are only for operation cost, leasing of trains from ALWEG Corporation, leasing of guideways and stations from Perbadanan Putrajaya.

C. *BUSINESS PLAN A*

1) Description of Business Plan A

Train

Units of trains	18
Price to purchase (per unit)	RM 30,000,000
Capacity per train (person)	160
Peak hour period (daily)	• 7am – 9am • 7pm – 9pm
Number of train runs (peak hours)	96 runs
Non-peak hour period (daily)	• 6am – 7am • 10am – 5pm • 7pm – 12am
Number of train runs (non-peak hour)	156 runs

Guideways

Length of guideway	13.6km
Installation of beamway (per km)	RM 3,500,000

Stations

Number of stations	18
Average lease of staton per annum (per station)	RM 350,000

Expected Pre-Occupation Costs

• Installation of beamway • Furnishes (stations) • Furnishes (trains) • Utilities • Legal fees • Ticketing machines • Purchasing of trains • Generator set • miscellaneous	Total : RM 665,571,500

Soft Loan

Expected soft loan to be received	RM 532,457,200
Expected period of loan payment	30 years

Ticket Price

Distances	Price
0 km - 2.00 km	RM 1.20
2.1 km - 4 km	RM 1.60
4.1 km- 6 km	RM 2.10
6.1km - 8 km	RM 2.50
8.1 km - above	RM 3.20
Average ticket price	RM 2.12

Advertisement

Train (per annum)	RM 1,200,000
Station (per annum)	RM 1,000,000

Kiosks

Rentable area (per station)	420 sq. ft.
Rental rate (per annum)	RM 42.00

2) Summary of Cash Flow - PLAN A

i. Financial Analysis

Financial analysis is carried out to prove the financial viability and feasibility of this project according to respective proposed business plans. The financial analysis is done based on CC's interest as the operator of PMT1. This financial analysis will enable CC to evaluate the profitability and the possibility of investing in the business. The financial analysis allows CC to determine all financial costs involved in the event of taking up the business. The period of the business is expected to be 30 years upon agreement.

ii. Payment

Based on Plan A, CC would suggest paying for the expenses to install the beamway, and the purchasing of 18 units of trains. It has been assumed that the amount of soft loan that could be given is 80% of the total pre-occupation costs. Therefore, the remaining 20% would be from the operator's equity. The suggested length of payment is for 30 years considering the large amount of loan that may be given. The amount of

payment is derived from the loan rate interest, expected amount of loan, and the length of payment. As of Plan A, the amount of loan payment is derived at RM 30,792,053 per annum for 30 years.

iii. Discounted Cash Flow (DCF)

Discounted Cash Flow (DCF) technique is used to show the inflows and outflows of the whole project throughout the whole development. The DCF method takes into account the time value of money by converting the future cash flows into present day value. The future cash flows will recalculate (discounted) to represent their present values.

The DCF for an investment also can be calculated by estimating the cash that have to be paid out and the cash which have expect to receive back. The timeframes that expected to receive the payments must also be estimated. This method is used to find the total Net Present Value (NPV) and the Internal Rate of Return (IRR).

iv. Net Present Value (NPV)

Net Present Value measures the combined worth of all cash flows (positive and negative) every year of a certain project within a given time. The cash flows are the net value received/loss in the proposed development in that particular year. The cash flow in this proposed development has taken into consideration all revenues, costs incurred in the proposed development which includes operating, annual expenses; financial and capital cost; and also the profit sharing as agreed in the concession agreement. The net cash flow of each year is discounted back to the present. From there, the Net Present Value is calculated by the summation of all the discounted cash flows within the given time of the development.

As of Plan A, the rate applied is the same as the capitalisation rate which is at 9%. The derived NPV from the DCF is RM (- 341,890,772). This is due to the insufficiency between the income generated and the business costs.

v. Internal Rate of Return (IRR)

Another way of analysing the performance of a development would be to use the Internal Rate of Return. When the cash flows of the development are discounted at the Internal Rate of Return, the Net Present Value would equal to zero. This means that at this rate the development does not gain profit neither does it loses. This can help measure the probability of the development gaining the return that investors expect. If the Internal Rate of Return is less than the expected rate of return, it means that the development is not profitable and the return that the investors want is unachievable. On the other hand if the Internal Rate of Return is higher than the expected rate of return the development is highly desirable. As of Plan A, the IRR could not be derived.

vi. Break-even Analysis

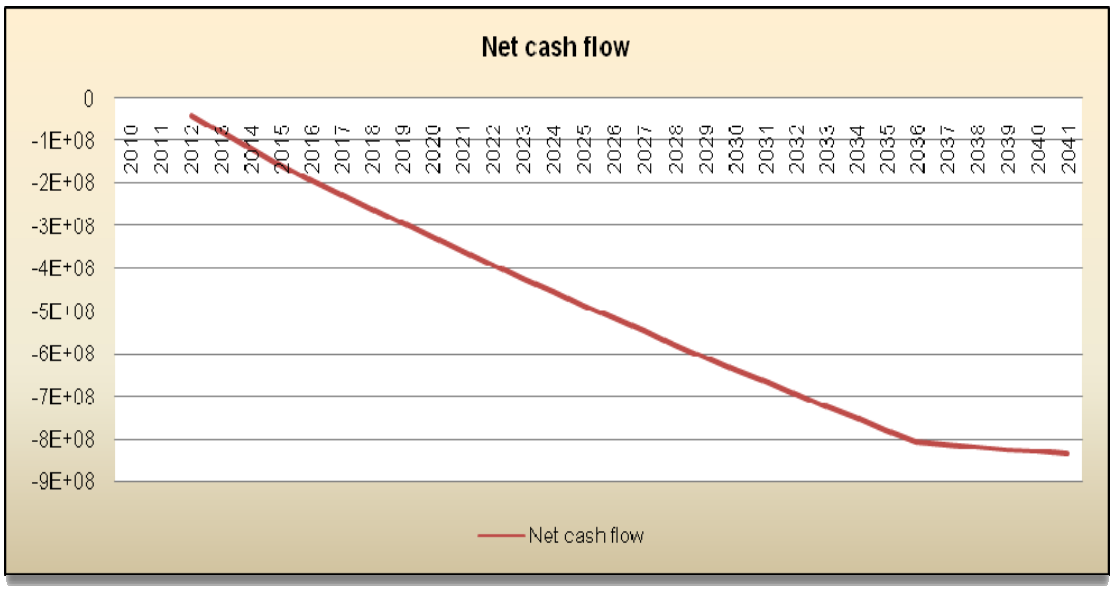

Figure 2. Net Cash Flow of Business Plan A

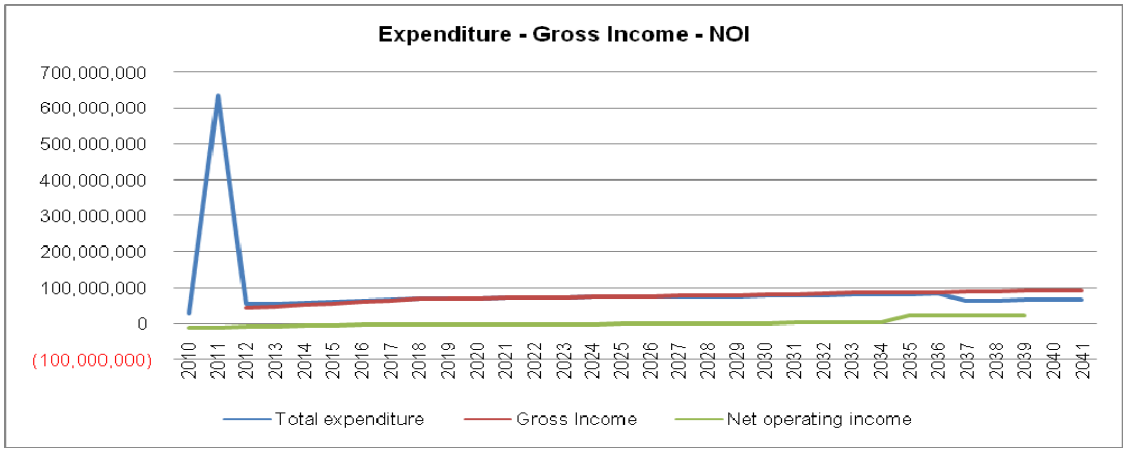

Figure 3. Expenditure, Gross Income and Net Operating Income of Business Plan A

Break-even point is found from the cash flows of the proposed development. At the break-even point, the present value of the proposed development would be equal to zero. This means that the cash outflows and inflows at that time is equivalent to each other. Generally, the present value before the break-even point would be on the negative side while after achieving the break-even point, the present value would be positive. The faster the break-even point is reached the better, as this shows that the development is able to gain profit.

Based on Figure 2 above, it can be concluded that the **Plan A is not feasible**. Break-even point could not be achieved within the concession period. The operator would suffer great loss financially as loss increases every year until exceeds RM800, 000,000 by the time the concession period ends. The derived NOI amount is also of very small figures in comparison to its staggering amount of debts.

3) Summary of Plan A

Based on the cash flow projection of Plan A, Plan A is not a viable business plan. The ticket fares are relatively too cheap considering the high amount of costs for the pre-occupation period of the business. Even after the lease period ends, the business will not see its break-even point within the lease period. The expected amount of loan needed by Putrajaya Monorail Bhd. is a staggering amount, and the to pay back the loan within 30 years would still require a big amount of payment, and the revenue that can be generated is not sufficient.

4) Recommendation

However, if CC still insists on purchasing the trains, Table 1 shows the suggested ticket fares for the business to derive to an accepted period of years to achieve its break-even point which is by the end of its 10th years of operation.

Table Ⅵ. Ticket price of Business Plan A (Revised Rate)

Distances	**Price**
0 km - 2.00 km	RM 7.50
2.1 km - 4 km	RM 8.00
4.1 km- 6 km	RM 8.50
6.1km - 8 km	RM 8.90
8.1 km - above	RM 9.30
Average ticket price	RM 8.44

vii. Business Plan A (Revised Rate)

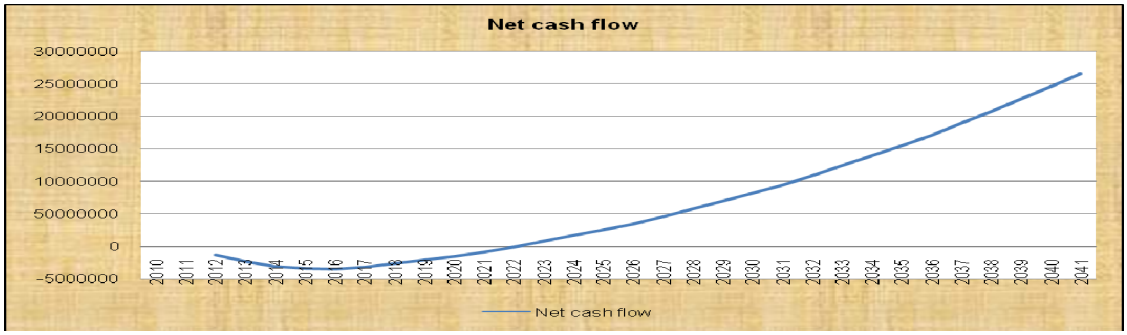

Figure 4. Net Cash Flow of Business Plan A (Revised Rate)

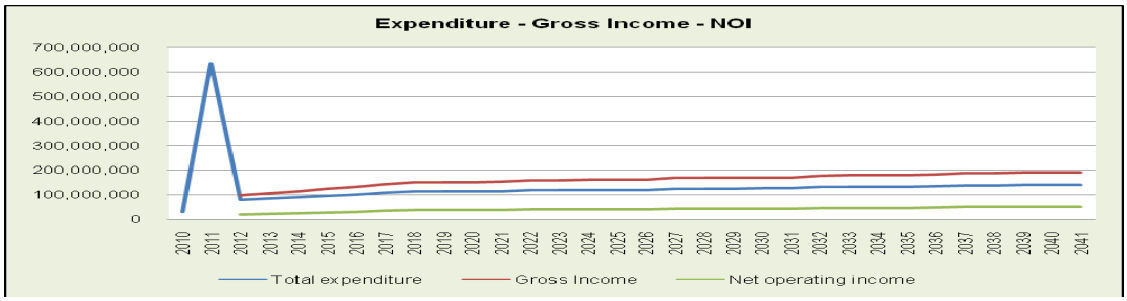

Figure5. Expenditure, Gross Income and Net Operating Income of Business Plan A (Revised Rate)

The NPV based on the above figures is RM 30,017,379 with IRR of 2.99 %. Although the IRR is fairly low in comparison to its expected rate of return, however this alternative is far more feasible than the previous alternative. Based on the Figures 4 and 5 above, it can be concluded that with the suggested ticket fares, it is more viable than the plan with the previous suggested ticket fares with the same costs. However, operator would have to come out with a staggering amount of equity which is at RM 133,144,300. If the operator decides to apply the suggested ticket price (revised rate), we highly suggest that CC proposes to the Government to subsidise a certain percentage of the fares (preferably not less than 70%). This is because to charge the public at these fares would only make the project not feasible due to its excessive price rates. So, to make Plan A financially feasible and viable, CC would have to increase its ticket prices and try to propose for the Government to subsidise at least 70% of the ticket prices, and in return the operator would provide an alternative mean for transportation in Putrajaya.

D. BUSINESS PLAN B

1) Description of Plan B

Train	
Units of trains	18
Lease per annum (per unit)	RM 700,000
Capacity per train (person)	160
Peak hour period (daily)	• 7am – 9am • 7pm – 9pm
Number of train runs (peak hours)	96 runs
Non-peak hour period (daily)	• 6am – 7am • 10am – 5pm • 7pm – 12am
Number of train runs (non-peak hour)	156 runs
Guideways	
Length of guideway	13.6km
Lease per annum (per km)	RM 400,000
Stations	
Number of stations	18
Average lease of staton per annum (per station)	RM 350,000
Expected Pre-Occupation Costs	
• Installation of beamway	Total : RM 48,488,948

• Furnishes (stations) • Furnishes (trains) • Utilities • Legal fees • Ticketing machines • Transportation cost • Generator set • miscellaneous	

Soft Loan

Expected soft loan to be received	RM 38,792,000
Expected period of loan payment	10 years

Ticket Price

Distances	Price
0 km - 2.00 km	RM 1.20
2.1 km - 4 km	RM 1.60
4.1 km- 6 km	RM 2.10
6.1km - 8 km	RM 2.50
8.1 km - above	RM 3.20
Average ticket price	RM 2.12

Advertisement

Train (per annum)	RM 1,200,000
Station (per annum)	RM 1,000,000

Kiosks

Rentable area (per station)	420 sq. ft.
Rental rate (per annum)	RM 42.00

2) Summary of Cash Flow - PLAN B

viii. Payment

Based on Plan B, CC would suggest leasing the stations and guideway from Perbadanan Putrajaya, and leasing 18 units of trains from ALWEG Corporation, Germany. It has been assumed that the amount of soft loan that could be given is 80% of the total pre-occupation costs. Therefore, the remaining 20% would be from the operator's equity. The suggested length of payment is for 10 years. The payment will be made starting on the 11th year of the operation. This is done so that the operator can generate a fair amount of income first, and then pay for the loan payment. This would result in a faster period in achieving its break-even point. The amount of payment is derived from the loan rate interest, expected amount of loan, and the length of payment. As of Plan B, the amount of loan payment is derived at RM 4,782,702 per annum for 10 years.

ix. Net Present Value (NPV)

The NPV derived from the cash flow of Plan B is RM 47,201,555. The rate applied here is at 9%. The NPV derived here shows that with this plan, the operator could make the business worth more due to its ability to generate more profit than the alternatives mentioned before.

x. Internal Rate of Return (IRR)

The IRR derived from the cash flow is at 19.43%. This percentage far exceeds the expected rate of return which is at 9%, of the project based on Plan B. This explains that by applying this plan, the business is feasible and viable financiall

xi. Break-even Analysis

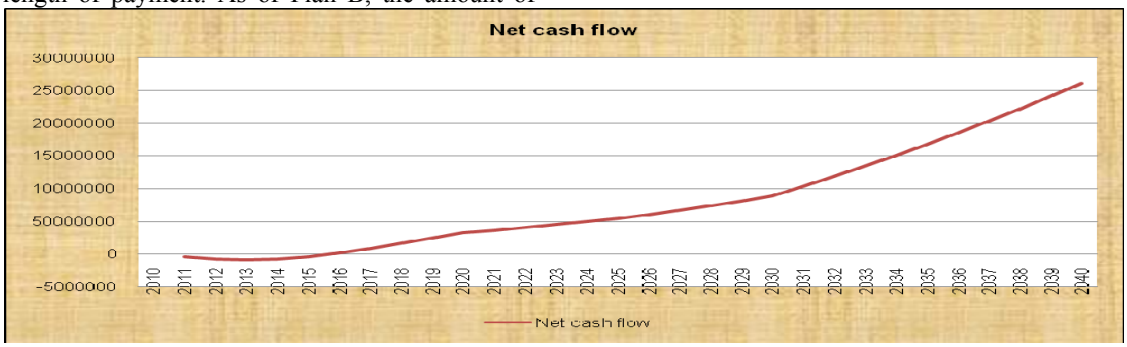

Figure 6. Net Cash Flow of Business Plan B

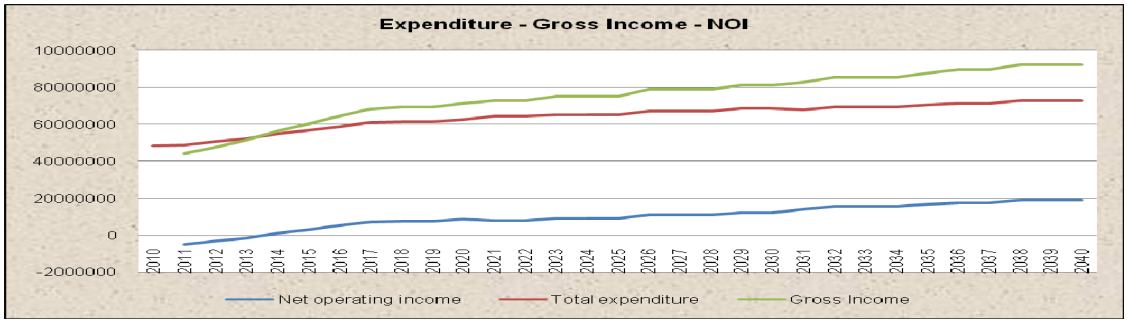

Figure 7: Expenditure, Gross Income and Net Operating Income of Business Plan B

Based on the Figures 6 and 7 above, Plan B can generate a fair amount of profit that would see the business achieves its break-even point by the end of its 5th year of operation, which is in 2015, as shown in the Net Cash Flow graph. This explains that with this plan, the project can be viable and feasible financially because not only does it achieve its break-even point within its contract period, but it also can achieve it within 10 years after of operation.

3) Summary of Plan B

Based on the IRR and its break-even analysis, it can be concluded that Plan B is viable and feasible financially. The IRR is higher than the expected rate of return which is at 19.43% in comparison with 9%. The break-even point can be achieved at the end of its 5th year of operation which is in 2015. For a business as big as a scale as this, to achieve its break-even point before ten years since its operation concludes that Plan B is a viable plan for this business.

VI. CONCLUSION

Based on the analysis of the financial cash-flow of the business plans above, it can be concluded that Plan B is the best plan to be applied by CC to ensure the viability of this project financially. The expected rate of return is 9%. Plan B exceeds this figure, and this explains that this plan can ensure the profitability of the business. The ticket rates applied in Plan B is also at reasonable rates. This can be a key factor in attracting potential consumers to make PMT1 as an important mean for transportation.

Table Ⅷ. Comparison of NPV, IRR and Break-even Point of Different Business Plans

	Plan A	**Plan A (Revised Rate)**	**Plan B**
NPV	RM (- 341,890,772)	RM 30,017,379	RM 47,201,555
IRR	-	2.99%	19.43%
Break-even (Year)	-	10	5

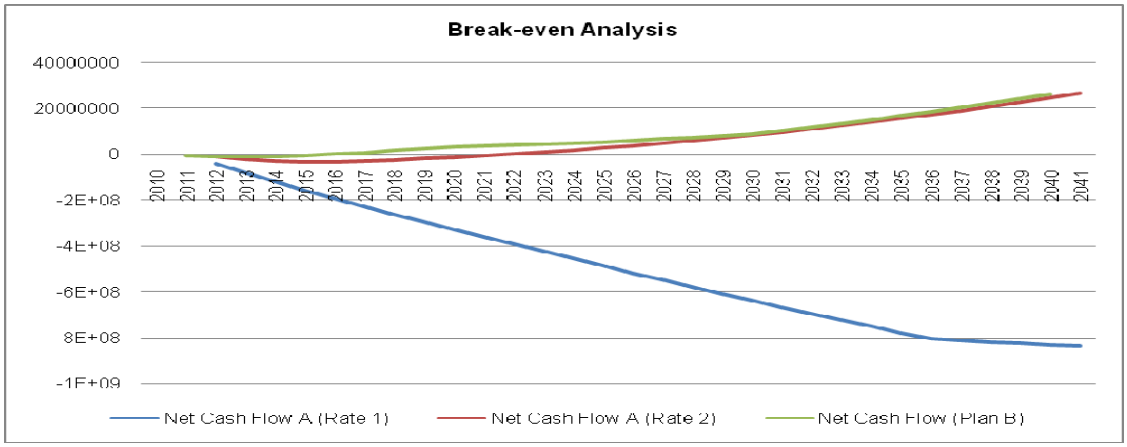

Figure 8. Break-even Analysis of Different Business Plans

Note:

For those who are interested to have the details cash flow of the business plans (in Excel 2003 format) please do not hesitate to email the authors.

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