# Financial Feasibility of the Investment Projects for the Conservation and Development of Bangkok Railway Station (Hua Lamphong) Area

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## Abstract

This paper studies the financial feasibility of the conservation and development of the Bangkok Railway Station (Hua Lamphong). There are three prospect investment schemes which consist of 1) conservation-based development, 2) creative-economy-based development, and 3) commercial-based development. This paper uses the Discount Cash Flow model with an investment period of 30 years. Several results emerged. First, the conservation-based development has a negative NPV of 3,261 million bahts with a payback period of 15 years. The creative-economy-based development has a positive NPV of 12,818 million bahts with a payback period of 7 years. Meanwhile, the commercial-based development has a positive NPV of 18,369 million bahts with a payback period of 6 years. Second, our sensitivity analysis shows that occupancy rate and pricing significantly determine the volatility of the projects' returns.

**Keywords:** 1) Financial Feasibility 2) Bangkok Railway Station (Hua Lamphong) 3) Conservation and Development Project

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## Introduction

The State Railway of Thailand has adopted its policy of relocating the capital railway station, Bangkok Railway Station (Hua Lamphong), to a new station recognised as Bang Sue Station. The goal is to reduce Hua Lamphong's role from the former starting point and hub of the railway station to a mixed-use area encompassed by residential and commercial activities capable of generating sustainable income in the future. The guidelines for the area development need to be seriously concerned about the preservation of historical value. It is because the area surrounding Bangkok Railway Station (Hua Lamphong), which spans 121 Rai, has a long and significant history and worth in Thai rail transportation. Besides, the area encompasses the local community and essential commercial districts, which influence the surrounding area in terms of the economy and culture of Thailand. According to the regional plan of the metropolitan development, Bangkok is likely to be a preferably livable city and the centre of tourism and services for its various historical and cultural attractions, worth inheriting and preserving arts and cultures, as well as a transportation hub, which extends prosperity to the surrounding area. Consequently, it is very essential to study the possibility of potential models and approaches for conservation and development that suit the location of the Bangkok Railway Station (Hua Lamphong). As a matter of fact that the government and investors pay attention to the future investment in conserving and developing the area of the Bangkok Railway Station (Hua Lamphong), the returns and new image of the developed area, contributing to the local community in terms of economy and conservation, should be considered. (Fakthong, Prapassornmanu and Punjatewakupt, 2021, pp.1-7)

For the mentioned objective of the state railway of Thailand, this study analyses the financial feasibility of three investment schemes to assess the investment viability of each conservation and development model. The three investment schemes consist of 1) conservation-based development, focusing on green areas such as gardens and parks, 2) creative-economy-based development, prioritising creative activity space as well as a balanced development of conservation and commercial, and 3) commercial-based development, which has the most commercial and business areas.

The results of this study are explicitly beneficial in formulating policy recommendations for the government to make decisions on area management and investment based on the most recent financial analysis in 2021 from reliable sources such as project development costs calculated by expert architects, income assessed by business sectors, or area activities evaluated upon a field study and data synthesis, including the fundamental tools for financial assumptions used in the financial feasibility analysis.

The findings show that conservative-based development has the lowest possibility of investment since it takes the longest time to pay back and gives a negative net present value. Although the rate of return on investment is positive, it is the least valuable compared to other investment schemes. It is because the proportion of developing areas in conserva-

tion-based development is mainly focused on green space like parks, which does not produce much income. In contrast, commercial-based investment, which has most areas of commercial and business, yields the most valuable, with a 6-year payback period and a high rate of return of 15.10%. The return from this investment plan is positive and the most profitable of all three investment types. This commercial-based development encourages most areas of business, allowing it to generate more income than others.

The findings above, however, do not include indirect advantages distributed to the surrounding society or local communities. For example, residents living in the nearby community and using the Bangkok Railway Station services will get more intrinsic benefits from the conservation-based investment with more green space. Their benefits will, on the contrary, lessen with the investment project with more commercial space. (Punjatewakupt, et al., 2022, pp.39-42)

This paper therefore suggests that if investors want to compromise and respect the voices of the local people while having good financial results at the same time, they may choose to invest in creative-economy-based development with a payback period of seven years, which is only one year longer than commercial-based development. Furthermore, this project has a positive net present value and yeilds a return on investment of 13.29%.

## Literature Review

The literature review consists of two sections. The first section contains an article on managing and developing the area around Bangkok Railway Station, Hua Lamphong. The second section includes a review of the financial feasibility literature.

### 1. Area allocation and development of Bangkok Railway Station (Hua Lamphong)

Bangkok Railway Station (Hua Lamphong) is located between the inner old city precinct and the developing new city. These two zones should therefore be jointly accessible via the developed area of the Bangkok Railway Station. It is essential to preserve their original values and, at the same time, to create new added values to boost the area's economy. According to its location, which has multiple channels for travel, it is the goal of this conceptual plan of conservation and development to transform the area into a hub of tourism and leisure in the city by providing a creative urban space combined with the knowledge and value inheritance of the Bangkok Railway Station. Regarding space allocation, the northern area will become commercially reformed as it will have two rail routes operating in this location. The central area will be served as a public space for easily accessible districts connecting to the encompassing residential, commercial, and tourist areas. On the south are the historical buildings of Bangkok Railway Station, which will be developed into a social and cultural hub with convenient access to the old commercial areas such as Talad Noi, Yaowarat, and the inner city. Moreover, it will have a public walking lane along the canal to connect the walkway between Green Line and Blue Line train in the future. In the study, the conservation and development area was divided into six sections, each denoted by a different colour to make it easier to

understand: (1) green is for public green space; (2) yellow is for urban space; (3) blue is for the area along Khlong Phadung Krung Kasem; (4) orange is for creative spaces, which contribute to local and commercial use; (5) red represents the creative economy, which includes commercial and business activities; and (6) brown represents conservation areas. (Srisakulchairak, Arnmanee and Uthaipattrakoon, 2020, pp.245-254)

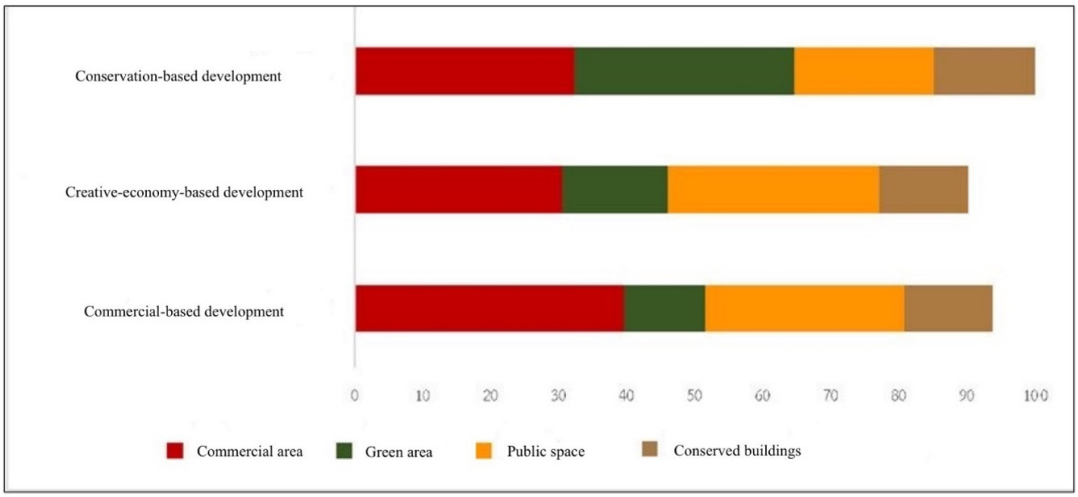
The relevant stakeholders in the area of conservation and development, consisting of nine groups: (1) residents of Wat Duang Khae and Salak Hin ally communities; (2) Bangkok Railway Station Organisation (Hua Lamphong) personnel; (3) clients of service; (4) public sectors; (5) private/commercial sectors; (6) academics and experts; (7) civil society; (8) education sectors; and (9) tourism-related private sectors, were asked to evaluate which area proportions they preferred. Gathering survey data, including in-depth interviews and public hearings, Punjatewakupt, et al. (2022, p.38) selected the top 10 choices ranked of area proportions in terms of popularity. According to these popular choices, we classified three schemes of investment as follows;

1) Conservation-based development scheme includes as many green spaces or parks as possible, with 32.3% commercial area, 32.3% green area, 20.5% public space, and 14.9% conserved buildings,

2) Creative-economy-based development scheme prioritises the area allocated for public benefits and economic activities with 30.4% commercial area, 15.6% green area, 31.1% public space, 13% conserved buildings, and 9.9% other areas such as roads.

3) Commercial-based development scheme highlights on the commercial and business areas with 39.5% commercial, 12% green area, 29.2% public space, 13% conserved buildings, and 6.3% other areas.

Picture No. 1 concludes these investment plans.




**Picture No. 1** The area proportion by the type of activities in each investment model

**2. Financial feasibility analysis**

This section contains literature review of the government's previous megaproject assessment. The first group includes the projects of Laem Chabang port construction in Thailand and the hydroelectric power plant in Syria. In project assessment, these two big public utility construction projects employed financial instruments like net present value (NPV) and internal rate of return (IRR).

Tangvitoontham and Chaiwat (2012, pp.307–314) assessed the domestic port (port A) construction at Laem Chabang port applying economic feasibility approach to evaluate project feasibility based on net present value (NPV) calculation. The result revealed a NPV of 618,705 million baht, an internal rate of return (IRR) of 16.81%, and a benefit-cost ratio of 1.27%, indicating that it is valuable for investing.

Bitar, et al. (2015, pp.404-413) conducted a financial feasibility study on the construction of a hydroelectric power plant in Syria and proposed several power plant designs, comparing unit cost, revenue-to-cost ratio, and payback period. The result shows that an investment in the 2x2500 kW power plant is the most cost-effective, with a 129.5% revenue-to-cost ratio and a 14-year payback period.

According to the business models of the two projects above, though they are large and run by the government, their source of revenues is not varied, unlike the conservation and development project of the Bangkok Railway Station area. The following is a case study of a project assessment with multi-channel income or benefit. Husin, et al. (2015, pp.73-83) studied the investment in the Sunda Strait Bridge construction in Indonesia by estimating the demand for the bridge construction to connect Sumatra and Chava Island in Indonesia. It is a megaproject by the Indonesian government and is worth more than 25 billion US$. It demonstrates the fundamental approach of functioning multi-channel revenue from various provisions such as transportation, wave energy, and wind energy. Furthermore, it is similar to Thai port construction in that most income or benefits are generated externalities. In addition to the study, this project could potentially produce more than 61.59 million US$ in revenue, a positive NPV, and an IRR of 7.56%.

The literature review demonstrates that both NPV and IRR are the standard tools to assess megaprojects as well as the conservation and development of the Bangkok Railway Station (Hua Lamphong) area project. Therefore, we utilize these tools to evaluate project feasibility in this paper.

**Methods**

The procedures of the study are as follows:

1. Determine project development proposals, utilisation of buildings and areas, future development and conservation approaches, including the types of businesses and activities operating in several buildings and locations.

2. Collect financial information relevant to and consistent with the project proposals to determine assumptions for finan-

cial feasibility. Those assumptions consist of construction cost assumptions, construction period assumptions, income assumptions, operating cost assumptions, and financial assumptions.

3. Use a discounted cash flow model with an investment period of 30 years, then calculate the financial indicators consisting of Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PB), and compare the results of each project.

Details in each procedure are demonstrated below.

**1. Project development proposal**

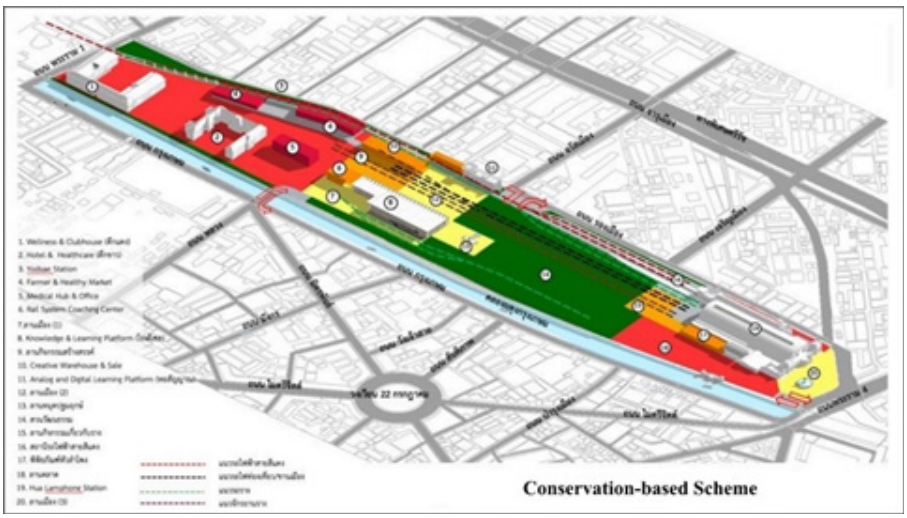
Wattanawanyoo and Tirapas (2021, pp. 68-90) proposed the three business models relevant to the three investment schemes as shown in Table No. 1.

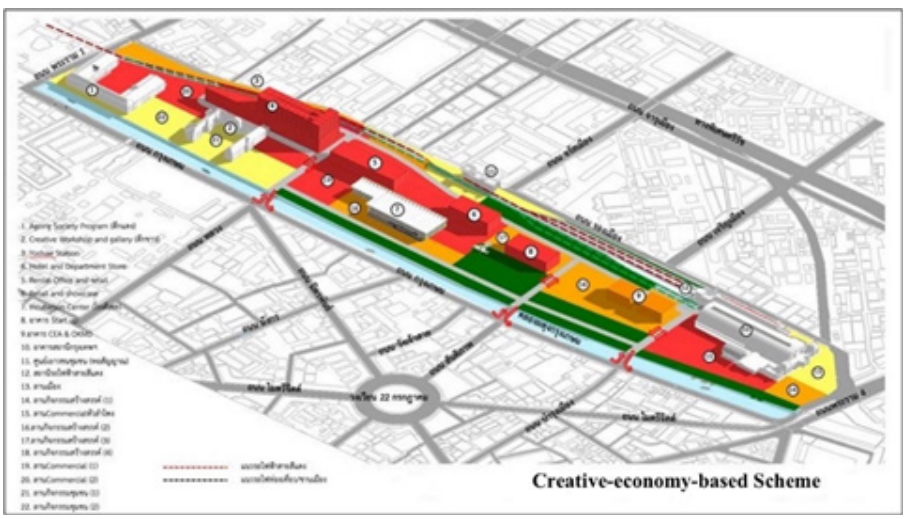
**Table No. 1** Project investment models

| Conservation-Based Development | Creative-Economy-Based Development | Commercial-Based Development |
|---|---|---|
| 1. Bangkok Railway Station Main Building: to become a museum, retail stores and restaurants | 1. Bangkok Railway Station Main Building: to become a museum, retail stores and restaurants | 1. Bangkok Railway Station Main Building: to become a museum, retail stores and restaurants |
| 2. Signal Tower: to become a community centre, local shops, and public space | 2. Signal Tower: to become a community centre, local shops, a youth centre, a local library, a public space, an exhibition hall, a studio, and a museum | 2. Signal Tower: to become a community centre, local shops, a youth centre, a local library, public space, an exhibition hall, a studio, and a museum |
| 3. Diesel Plant Building: to become a learning centre | 3. Diesel Plant Building: to become a commercial space, studio, gallery, seminar rooms, and event halls. | 3. Diesel Plant Building: to become a commercial space, studio, gallery, seminar rooms, and event halls. |
| 4. White Building: to become a hotel area | 4. White Building: to become shops, a studio, and an art gallery | 4. White Building: to become shops, a studio, and an art gallery. |
| 5. Red Building: to become shops, a clubhouse, a studio, and a gallery | 5. Red Building: to become a medical centre, a nursery, shops, and restaurants. | 5. Red Building: to become a medical centre, a nursery, shops, and restaurants. |
| 6. Medical & Office: to become a medical centre & office and rental offices. | 6. Hotel & Department Store: to become hotels and shopping malls. | 6. Hotel & Department Store: to become hotels and shopping malls. |
| 7. Farmer Market & Restaurant building: to become a shopping centre, shops and restaurants. | 7. Building for a start-up business centre | 7. Building for start-up business centre |
| 8. Warehouse: to become a local occupation training centre, meeting rooms and shops. | 8. Retail & Showcase building: to become rental space and public event space. | 8. Retail & Showcase building: to become rental space and public event space. |

| Conservation-Based Development | Creative-Economy-Based Development | Commercial-Based Development |
|---|---|---|
| 9. Train museum | 9. Building for rental offices and shops | 9. Building for rental offices and shops |
| 10. Publish space for activities and shops | 10. Learning centre building | 10. Learning centre building |
| 11. Green area and park | 11. Public space for activities and shops | 11. Public space for activities and shops |
| | 12. Green area | 12. Green area |

Diagrams illustrating the models of areas and businesses are in Picture No. 2, where red represents a commercial area, orange and yellow are public spaces, and green are parks and gardens.




**Picture No. 2** Diagrams showing three business models

Source: Wattanawanyoo and Tirapas (2021, pp.86-88)

**2. Financial Assumptions**

**2.1 Construction cost assumptions**

The construction cost assumptions shown in Table No. 2 include:

(1) Pre-construction costs

Bangkok Railway Station has a total area of 120 rai 2 ngan 3.2 wa. The appraisal price of the land is 300,000 THB per sq.wa. In addition, we estimated the operation cost for the construction permit and an environmental impact assessment (EIA) at 3,000,000 THB.

(2) Total Construction costs.

Construction costs, including total costs of building construction, interior design, and landscape architecture, are accumulated by construction and interior design professionals based on the size of the usable area in each project.

(3) Additional budget and expert costs

The estimation of an additional budget for construction is equal to 5% of the overall construction costs in each area, including an expense for hiring experts for consulting and controlling the construction throughout the project. The payment for the project manager costs 0.5% of the total construction budget, while the compensation for the specialist costs 5% of the total construction budget.

(4) Pre-opening marketing budget

We also calculated the budget for pre-opening marketing, advertising, and management before the actual operation.

(5) Other costs

The other costs necessary for the project's development include a management budget throughout the project's life, which is approximately 5,000,000 THB, primarily for hiring new employees and maintaining capital cash flow. In addition, there is a cost for insurance during construction, which is 0.25% of the overall cost.

In conclusion, the investment cost for the conservation-based development is equal to 18,715,164,000 THB, the creative-economy-based development costs 20,684,561,000 THB, and the commercial-based development is 21,826,462,000 THB.

**Table No. 2** Project development cost

| Project Development Costs (Thousand Baht Units) | Conservation-Based Development | Creative-Economy-Based Development | Commercial-Based Development |
|---|---|---|---|
| **1. Pre-construction costs** | | | |
| Land and area improvement | 14,460,960 | 14,460,960 | 14,460,960 |
| Expenses for a construction permit and an environmental analysis assessment | 3,000 | 3,000 | 3,000 |
| **2. Construction costs** | | | |
| Building construction | 2,794,328 | 3,536,176 | 4,234,119 |
| Interior design | 950,100 | 1,951,082 | 2,263,670 |
| **3. Expert costs** | | | |
| Project management team | 18,722 | 27,436 | 32,489 |
| Expert team | 187,221 | 274,363 | 324,889 |
| **4. Additional costs** | 187,221 | 274,363 | 324,889 |
| **5. Marketing costs before operating** | 15,000 | 15,000 | 15,000 |
| **6. Other costs** | | | |
| Project management budget | 5,000 | 5,000 | 5,000 |
| Construction insurance | 93,611 | 137,181 | 162,445 |
| **Total costs of project development** | **18,715,164** | **20,684,561** | **21,826,462** |

### 2.2 Construction period assumptions

The construction period consists of 3 phases. The first phase is planning and evaluating, which takes six months. The second phase is the construction, lasting 30 months. And the third phase is the project completion and is ready to operate.

### 2.3 Income assumptions

We classified the business generating income into 12 types, as shown in Table No. 3. In general, the revenue results from the price multiplied by quantity, or, in this case, the rental price per square metre multiplied by the area of the rental space. We also modified the income to be more reasonable by determining that each business has a 90% occupancy rate and that prices will rise 10% every three years.

**Table No. 3** Business pricing and quantity

| | Businesses | Price | Purchase/ Occupancy Rate (%) | Quantity | Conservation-Based Development | Creative-Economy-Based Development | Commercial-Based Development |
|---|---|---|---|---|---|---|---|
| 1 | Museum | 100 THB/time[1] | 90 | Audience/year (person) | 54,000 | 54,000 | 54,000 |
| 2 | Parking | 20 THB/hr[2] | 90 | Parking lot (unit) | 2,469 | 648 | 757 |
| 3 | Hotel Room A | 3,000 THB/night[3] | 90 | Room/night (room) | 60 | 133 | 133 |
| 4 | Hotel Room B | 5,000 THB/night[3] | 90 | Room/night (room) | 14 | 14 | 14 |
| 5 | Hotel Room C | 10,000 THB/night[3] | 90 | Room/night (room) | 2 | 14 | 14 |
| 6 | Hotel Banquet Room | 2,000 THB/person[3] | 90 | Person/day | | 2,270 | 2,270 |
| 7 | Hotel Restaurant | 2,000 THB/person[3] | 90 | Person/day | | 683 | 683 |
| 8 | Rental Office A | 700 THB/$m^2$/mth[4] | 90 | Rental area ($m^2$) | 9,506 | 9,430.4 | 9,430.4 |
| 9 | Rental Office B | 1,000 THB/$m^2$/mth[4] | 90 | Rental area ($m^2$) | 10,645 | 16,845 | 33,690 |
| 10 | Retail Shop | 1,000 THB/$m^2$/mth[4] | 90 | Rental area ($m^2$) | 67,892 | 66,715 | 77,619 |
| 11 | Show/ Exhibition/ Workshop/ Gallery | 150 THB/$m^2$/day[5] | 90 | Rental area ($m^2$) | 5,110 | 15,731 | 24,469 |
| 12 | Seminar/ Banquet room | 300 THB/$m^2$/day[5] | 90 | Rental area ($m^2$) | | 1,957 | 1,957 |

Note:
1.Ticket prices, based on Museum Siam, June 2021.
2.Parking fee, based on Samyan Mitrtown rate, June 2021
3.The average market price of 4-5 star hotels in Bangkok, June 2021.
4.Office rental prices, based on the Samyan Mitrtown Building rate. Rental office A type has a 30% discount for government sectors as of June 2021.
5.The price of rental space, based on the Samyan Mitrtown Building rate, June 2021.

**2.4 Operating cost assumptions**

(1) Staff Cost

We calculated the number of staff in each business based on the in-used area and then assessed the compensation compared to a similar business. For example, in the museum area, Museum Siam was chosen as a model for calculating employee costs, considering the quantity of staff, positions, and salaries, including the number of staff per area used. Compared to the Museum Siam, we determined the proportion of museum area in each investment model and the number of employees in all positions to fit within each model. As for hotels, the number of employees depends on the number of rooms, calculated at 1 to 1 ratio. Additionally, we assumed that employee salaries in all positions would increase by 2% per year.

(2) Operation Cost

Operation costs, i.e., costs of utilities, administration, marketing, rental, and service, as well as maintenance, are allocated in proportion to revenue compared to similar businesses. The operation costs for three investment models are shown in the following table.

**Table No. 4** Operation cost

| Operation Cost of Business | Percentages | | | | | |
|---|---|---|---|---|---|---|
| | Utilities | Administration | Marketing | Rental & service | Maintenance | Total |
| Museum and hotel | 3.6 | 6.7 | 1 | 1 | 1 | 13.3 |
| Parking spaces, office and rental stores, galleries, exhibitions, workshops, and seminar rooms. | | 12.5 | | | | 17.5 |
| Green area | | 2 | | | 8 | 10 |
| Public space (Cost of Employee) | The operation cost is 87.14% of the total staff cost in public space, calculated from the staff cost per the operation cost of rental space for the exhibition | | | | | |

(3) Household tax accounted for 12.5% of half of the revenue. (Land and Building Tax Act B.E. 2562 (2019))

(4) The insurance cost is 5% of the development costs.

(5) Contingency equals 2.5% of total revenue.

**2.5 Other financial assumptions**

The project analysis determined the base case of financial scenarios as follows.

(1) In the case of loans, the debt to equity ratio is 80:20 of the construction cost.

(2) The loan interest rate is 6.5% per year, averaged based on the minimum loan rate for privileged customers of several commercial banks in 2021. (Bank of Thailand, 2021)

(3) Loan repayment is 10 years with a one-year grace period.

(4) The project period is 30 years.

(5) The discount and the terminal capitalisation rate are determined as 8%, based on payment of the 50-year government bonds of 2.92% + other risks of 5-6%. (ThaiBMA, 2021)

(6) Depreciation cost is calculated based on the straight line basis of asset value at 25% of the development costs over 20 years without scrap value.

(7) Corporate income tax is charged at a fixed tax rate of 20% of income after depreciation and interest, in accordance with the corporate income tax calculation of the Revenue Department for net revenue exceeding 3 million THB. (The Revenue Department, 2021)

## 3. Models and tools used for financial analysis

Generally, long-term investment with several years of operation has costs and benefits incurred in the present and future. For this reason, future costs and benefits are essentially discounted to the present. This research has applied the discounted cash flow model over an investment period of 30 years, accounting for factors such as investment and operation costs, income, financial returns, funds, financial sustainability, asset life, scrap value, inflation rate, and others. To finalise the most worthwhile investment model, we used the following standard tools (Boardman, et al., 2018, pp.201-268; Campbell and Brown, 2003, pp.62-91):

(1) Net Present Value (NPV)

Net present value is the net benefits in various investment periods, calculated from the difference between benefits and overall costs over the entire life of the investment. The net benefits incurred will be discounted at a discount rate to reduce the future net benefit value to the present. The formula for net present value is:

$$NPV = \sum_{t=0}^{n} \frac{B_t - C_t}{(1+r)^t}$$

where $\mathbf{NPV}$ is the net present value. $\mathbf{t}$ is the investment period, $\mathbf{n}$ is the number of years or investment lifetime, $\mathbf{B_t}$ is the benefits in year $\mathbf{t}$, $\mathbf{C_t}$ is the investment cost in year $\mathbf{t}$, and $\mathbf{r}$ is the discount rate.

Projects that are worth investing in must have a positive net present value. It means the present value of benefits exceeds the present value of costs. As a result, when comparing several investments, the one giving the highest net present value is considered the best.

(2) Internal Rate of Return (IRR)

An internal rate of return is a discount rate that makes a net present value equal to zero. It is the average annual rate of return that investors will receive from their investment over the lifetime of the investment.

The valuable investment must have a return on investment higher than the opportunity cost of funds, represented by an interest rate (r), or IRR > r.

(3) Payback Period (PB)

Payback period calculation is a method used to determine how long the project takes to recover its investment cost. A shorter payback allows preferable cash flow and less risk. The payback time refers to the years from the initial year of investment to the year in which the accumulated cash flow reaches the break-even point. Decision-making on investment will consider the payback period compared to the desired period. It may vary in each project depending on the preferable time to recover the initial cost. The shorter payback period means a more desirable investment.

**Results**

The results of the base case financial analysis and the sensitivity analysis are as follows:

**1. Financial feasibility analysis**

The results of the financial feasibility revealed that the investment in conservation-based development has a negative net present value of -3,260,680,678 THB with a payback period of 15 years and a 6.19% internal rate of return. The investment in the creative-economy-based development provides a positive net present value of 12,817,570,018 THB with a 7-year payback period and a 13.29% internal rate of return. The investment in commercial-based development has a positive net present value equal to 18,368,763,714 THB with a 6-year payback period and a 15.10% internal rate of return. The results of the financial study are shown in Table No. 5.

**Table No. 5** Financial Results

| Financial Tools | Conservation-Based Development | Creative-Economy-Based Development | Commercial-Based Development |
|---|---|---|---|
| Payback Period (year) | 15 | 7 | 6 |
| Net Present Value (Baht) | -3,260,680,678 | 12,817,570,018 | 18,368,763,714 |
| Internal Rate of Return (%) | 6.19 | 13.29 | 15.10 |

The study found that conservation-based development is the least possible because it takes the longest payback time and has a negative net present value. Although the rate of return on investment is positive, it is the lowest number compared to all three models. That is because the project mainly focuses on green areas, which can not generate sufficient income. However, the commercial-based development gives the best financial results because it presents the most positive and net present value in all three models. It has a payback period of 6 years and a high internal rate of return of 15.10%. Moreover, this devel-

opment model is highlighted on the red area, which contains most business and commercial areas, encouraging the model to generate preferable income over others.

Punjatewakupt, et al. (2022, pp.39-42) discovered that stakeholders in the conservation and development of the Bangkok railway station (Hua Lamphong) area do not prefer and have a slight intention of developing commercial and business areas. Consequently, having this commercial area will decrease the willingness to pay for the conservation and development of the Bangkok Railway Station (Hua Lamphong) area. We, therefore, believe that if investors could respect the stakeholder's voices while expecting a better financial return, they may choose to invest in creative-economic-based development, which gives a good yield on investment and is not much different from the commercial-based model. It is to value the voices of stakeholders who prefer green spaces and do not like business and commercial spaces. This mixed-investment model will prioritise activity spaces as well as creative economies. This creative-economy-based development offers a payback period of 7 years, which is only one year longer than the commercial-based development. Furthermore, this investment model has a positive net present value and a 13.29% internal rate of return, which is above the discount rate. It is eventually qualified as a preferable model of investment.

**2. Sensitivity analysis**

**2.1 Assumptions of sensitivity analysis**

The sensitivity analysis in this section determines the parameters input variously to analyse the variation of investment returns when the financial assumptions differ from the base case. The outcomes of each case are taken into account in the best case scenarios and worst case scenarios. The assumptions for analysing sensitivity consisted of loan drawdown, total construction costs, occupancy rate, and price of goods or services. The three investment models must be inputted with different parameters to analyse each own financial sensitivity. The parameters were separated into 10 cases, shown in Table No. 6.

**Table No. 6** Parameters of Sensitivity Analysis

| Cases | Assumptions (%) | | | |
|---|---|---|---|---|
| | Loan Drawdown | Total Construction Costs | Occupancy Rate | Price of Goods/ Services |
| Base case | 80 | 100 | 90 | 100 |
| 1. No loans | 0 | 100 | 90 | 100 |
| 2. No personal funds | 100 | 100 | 90 | 100 |
| 3. High construction costs | 80 | 115 | 90 | 100 |
| 4. Low construction costs | 80 | 85 | 90 | 100 |

| Cases | Assumptions (%) | | | |
|---|---|---|---|---|
| | Loan Drawdown | Total Construction Costs | Occupancy Rate | Price of Goods/ Services |
| 5. Economic growth | 80 | 100 | 100 | 100 |
| 6. Economy recession | 80 | 100 | 70 | 100 |
| 7. Low price | 80 | 100 | 90 | 90 |
| 8. High price | 80 | 100 | 90 | 110 |
| 9. Worst | 80 | 115 | 50 | 50 |
| 10. Best | 80 | 85 | 100 | 110 |

The parameters are input into each assumption and compared with the base case. Each assumption is determined by a set of desirable variables as follows:

(1) Loan drawdown expresses a percentage of total investment assets (liabilities plus equity) which can be categorised into case 1, no loans with a 0% loan rate; and case 2, no personal funds. Both cases are with 100% of construction costs.

(2) The construction and interior design costs shown in case 3 are high, while in case 4, they are low, accounting for 115% and 85% of the base case, respectively.

(3) Occupancy rate or the ratio of each business' purchasing or using services, in case 5 indicates the highest growth (Peak), and in case 6 presents the regression (Regress), calculated based on a maximum production capacity of 100% and 70%, respectively.

(4) Price of goods and services sold or rendered in every 12 businesses presents 90% and 110% of the base case in cases 7 and 8, respectively.

Moreover, case 9, the worst case, has construction costs of 115% of the base case, an occupancy rate of 50% of the maximum capacity, and prices of goods and services equal 50% of the base case. Lastly, case 10, the best case, has a construction cost of 85% of the base case, an occupancy rate of 100% of the maximum capacity, and prices of goods and services increased to 110% of the base case.

**2.2 The results of financial feasibility in the sensitivity analysis**

The sensitivity analysis considers the consequence of shifting in determining variables when other financial models and assumptions remain the same, equal to the base case. By modifying various parameters based on the sensitivity analysis, the results of the financial sensitivity in each case are demonstrated in Table No. 7.

**Table No. 7** Financial results of sensitivity analysis

Unit: PB (Year), NPV (billions THB), and IRR (%)

| Project Development | Conservation-Based Development | | | Creative-Economy-Based Development | | | Commercial-Based Development | | |
|---|---|---|---|---|---|---|---|---|---|
| Cases | PB | NPV | IRR | PB | NPV | IRR | PB | NPV | IRR |
| Base | 15 | -3.26 | 6.19 | 7 | 12.82 | 13.29 | 6 | 18.37 | 15.1 |
| 1. No loans | 16 | -5.17 | 5.39 | 9 | 10.03 | 11.65 | 8 | 15.07 | 13.04 |
| 2. No personal funds | 14 | -2.78 | 6.42 | 7 | 13.51 | 13.78 | 6 | 19.19 | 15.72 |
| 3. High construction costs | 15 | -3.48 | 6.09 | 8 | 12.51 | 13.11 | 7 | 18 | 14.87 |
| 4. Low construction costs | 14 | -3.04 | 6.3 | 7 | 13.13 | 13.48 | 6 | 18.74 | 15.32 |
| 5. Economy growth | 13 | -1.92 | 6.97 | 7 | 16.05 | 14.42 | 6 | 22.26 | 16.34 |
| 6. Economy Regression | 18 | -5.95 | 4.46 | 9 | 6.36 | 10.83 | 8 | 10.58 | 12.4 |
| 7. Low price | 16 | -4.47 | 5.45 | 8 | 9.91 | 12.22 | 7 | 14.86 | 13.92 |
| 8. High price | 14 | -2.05 | 6.9 | 7 | 15.72 | 14.31 | 6 | 21.88 | 16.21 |
| 9. Worst | > 30 | -12.22 | -1.64 | 22 | -8.48 | 2.94 | 19 | -7.32 | 3.92 |
| 10. Best | 12 | -0.35 | 7.82 | 6 | 19.59 | 15.69 | 5 | 26.53 | 17.77 |

2.2.1 Effects of variation in the construction loan ratio

The study's findings suggest that using personal funds in the investment reduces project liquidity and tends to lower overall turnover compared to the base case, whereas using loans allows greater liquidity and financial outcomes compared to the base case.

Shifts in construction loans will similarly affect the financial status of each project in the future. The commercial-based development is the most profitable, with an average annual internal rate of return of 13.04% to 15.72% per year. The creative-economy-based investment has the second highest internal rate of return, averaging between 11.65% and 13.78% per year. The conservative-based development is the least profitable, with an annual internal rate of return ranging from 5.39% to 6.42% on average.

2.2.2 Effects of variation in project construction costs

The study found that an increase of 15% in construction costs marginally decreases financial results compared to the base case, whereas a 15% reduction in construction costs gives a higher financial return than the base case.

According to the study, the variation in construction costs affects the financial status of each investment model in the same direction. The higher construction costs tend to lower the return on investment. The commercial-based development provides the most profitability, with an average annual internal return of 14.87% to 15.32%. The second highest re-

turn is the conservation-based merged with the commercial-based development, with an internal rate of return averaging between 13.11% and 13.48% per year. The conservation-based development presents the lowest internal rate of return, ranging between 6.09% and 6.30% annually on average. As a result, the commercial-based investment is the most sensitive to the variation in construction costs, while the conservation mixed commercial-based development and the conservation-based development are the second and third most sensitive, respectively.

2.2.3. Effects of variation in the occupancy rate

According to the study, the variation in the occupancy rate is an external factor reflecting the uncertainty and volatility of the economy, which directly impacts either the investment's revenues or various activities. With the highest capacity, every investment produced better income and financial returns. On the other hand, it would be lower with less occupancy.

The occupancy rate influences the financial status of each project in the same direction. When the economy is favourable, the revenue or return tends to rise accordingly. The commercial-based invest ment is still the most profitable model, with an internal rate of return averaging between 9.28% and 16.34% per year. The second highest return is the creative-economy-based investment, having an average annual internal rate of return of between 7.95% and 14.42%. The conservation-based investment is the lowest, with an internal rate of return ranging from 2.33% to 6.97% per annum. Variation in the occupancy rate causes a wide range of returns, especially in commercial-based and creative-economy-based developments.

2.2.4 Effects of variation in the price of goods or services

The study found that price variation is another significant external factor reflecting the economic direction. It directly impacts the income of the commercial businesses in the project. The increase in the market price demonstrates higher demand, revenue, and better financial results, respectively. On the contrary, the decreased market price leads to worsening financial outcomes.

Variation in the price of goods or services directly affects the income of each investment project. If the price of goods or services is higher, it will increase the revenue or return of the project in the same direction. The most profitable goes to commercial-based development, with an internal rate of return averaging between 8.4% and 16.21% per year. The second highest return is from creative-economy-based development, with an internal rate of return ranging between 7.13% and 14.31% per year on average. And the internal rate of return on conservation-based investment is the lowest, averaging between 1.75 and 6.9% per year. The effect of variation in the price of goods or services provides a wide range of returns, especially in commercial-based development and the conservation of mixed commercial-based development, which have overlapping potential return ranges.

2.2.5 The worst case and the best

The worst and best cases determined from sensitivity analyses are demonstrated in cases 9 and 10, respectively. In conservation-based development, the worst-case scenario has an internal rate of return of -1.64%, a net present value of -12.22 billion THB, and cannot pay back within 30 years. On the contrary, the best case scenario shows a 7.82% internal rate of return, which is higher than the base case, a negative net present value of -0.35 billion THB, and a payback period of 12 years, which is 3-years shorter than the base case.

In the creative-economy-based development, the worst-case scenario shows a 2.94% internal rate of return, a net present value of 8.48 billion THB, and a payback period of 22 years, which is 15 years longer than the base case. The best case scenario has a 15.69% internal rate of return, which is higher than the base case, a net present value of 19.59 billion THB, and a payback period of 6 years, which is only a year shorter than the base case.

In commercial-based development, the worst-case scenario has a 3.92% internal rate of return, a net present value of -7.32 billion THB, and a payback period of 19 years, 13 years longer than the base case. The best case scenario presents a 17.77% internal rate of return, increasing from the base case, a net present value of 26.53 billion THB, and a payback period of 5 years, which is only a year shorter than the base case.

## Conclusion and Discussion

This study examined the investment model and analysed the financial feasibility of conservation and development in the Bangkok Railway Station (Hua Lamphong) area. The results of the study will be a guideline for future development in the area of Bangkok Railway Station (Hua Lamphong). The study presents three schemes of investment: 1) conservation-based development; 2) creative-economy-based development, which emphasises balancing conservation and commercial development; and 3) commercial -based development.

The investment approaches in this research apparently have different goals, allowing distinctive returns and financial feasibility. The commercial-based development plan provides the highest profitability and financial feasibility, with most areas contributing to commercial businesses. The second and last are creative-economy-based development and conservation-based development plan, respectively.

Considering the cost and financial benefits of the investment, over a 30-year operation, each investment model yields different financial returns. Each investment model gives distinctive results in terms of financial feasibility. The conservation-based development is the least cost-effective due to its negative net present value of 3,261 million THB, with a 15-year payback and an internal rate of return on investment of 6.19%. The most medium cost-effective plan is creative-economy-based development. It has a positive net present value of 12,818 million THB, a 7-year payback period, and a 13.29% internal rate of return. The most profitable investment is the commercial-based development, with a positive net present value of 18,369 million THB, a 6-year

payback period, and a 15.10% internal rate of return. Although this conservation-based investment has a negative net present value and is considered the least worthwhile investment, it still has a chance. Ultimately, there may be opportunities for joint ventures between the private and public sectors, with government support for this development to meet the needs of residents who prefer green spaces to business locations.

Regarding investments with low financial returns, policymakers may take into account land and value capture (LVC), a tool used in development-based areas. In particular, the transfer of development rights (TDR) in terms of air rights sales can produce more income from selling the rights over buildings where the owner's rights are limited by the restrictions on the registered ancient places.

The investment models in this research are susceptible to external factors, which are counted for the sensitivity analysis. The occupancy rate and the price of goods or services are significant external factors to determine the volatility of returns in each investment model. Internal variables, like construction loans and construction costs, affect the financial returns slightly. The findings also reveal that the investment models could withstand a certain amount of volatility resulting from a failure to control loans and construction expenses. In the worst-case scenario, the returns of both the creative-economy-based and the commercial-based development are very similar. The conservation-based investment produces low returns despite the lower uncertainty. In addition, under optimistic financial assumptions in the base case, results in the best case scenario are slightly different from the base case.

In summary, variations in assumptions inevitably affect study outcomes. The risks in various businesses and activities in the developing area require further in-depth study. It considers the future changes in consumer behaviours such as working behaviours, consumption, tourism, lifestyle, population structure, and competition in hotels and tourism, including an analysis of demand and supply in commercial space and rental offices, which are currently experiencing both present and future oversupply.

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