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INNOVATION IN RAILWAY INVESTMENT FINANCING THROUGH THE LAND VALUE CAPTURE EARMARKS SCHEME

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ABSTRACT

The government of Indonesia is currently working to improve infrastructure, with a particular focus on the railway sector, in order to make transportation more accessible and affordable for all citizens. Therefore, this study aims to determine the reliability of alternative financing for the Land Value Capture (LVC) scheme, especially through earmarks (land tax increase). This scheme is very interesting to examine due to its great implementation potential in Indonesia. In this study, the primary data were obtained from direct measurements in the field of information derived from accessibility factors. Meanwhile, the secondary data were in the form of land price data in the NJOP (Tax Object Sale Value), as well as site structure, and its environment. From this context, the land price forecasting model used the Hedonic method developed into a Log-Log equation and was analyzed by using multiple regression statistical techniques with iterations, to obtain the best model. The LVC calculation also used the calculation formula for Land and Building Tax (PBB), as stated in Governor of Jakarta Regulation No. 77 of 2014. Based on the results, the development stage of the land price forecasting model showed that the independent variables with the most significant contribution ($\alpha > 0.005$) were dominated by accessibility-related factors. In the residential, office, and commercial areas, the maximum increase in land value ranged from IDR 696.8 thousand/m^2-IDR 30.5 million/m^2, IDR 1.25 million/m^2-IDR 41.4 million/m^2, and IDR 595.9 thousand/m^2-IDR 24.4 million/m, respectively. These estimations were observed with an average increase in the earmarks of all stations at 39.84%. Regarding the initial year of the project operation, the LVC value also obtained the maximum coefficient of the tax difference scheme from 21 stations at IDR 471,941,540,397/year.

1. Introduction

The railway sector presents a significant investment challenge because it requires a large amount of initial capital. These projects are considered long-term assets and have difficulty generating profits [1]. This makes it difficult to meet the criteria for an investment project [2]. Additionally, there is a large gap between the income generated through user payment and the costs of investment (CAPEX) and operation/maintenance (OPEX).

According [3] the difficult situation encountered caused a weak investment climate in the railway sector. This was mainly because the private investors were not enthusiastic about participating in the development of the railway networks due to the profile of the project investment. However, trains are one of the vital transportation modes that should reach all layers of society [4]. Based on these arguments in the process of determining tariffs, especially urban trains, the role of the government as a regulator is very dominant. For example, the determination of integrated tariffs for Transjakarta, MRT, and LRT, which were regulated through Governor of Jakarta Regulation No. 733 of 2022. This condition specifically triggers a very wide gap between the railway investment value and the income obtained through the user charges (farebox) set by the government.

To overcome these problems, a ticket tariff subsidy scheme, namely PSO (Public Service Obligation) instruments, need to be implemented as the general solution effort in most countries around the world, especially developing nations. This effort is solely performed to provide mass transportation services to the general public at affordable prices [5]. The government is also responsible for the performance of similar actions

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through the Governor of Jakarta Regulation No. 46 of 2022, regarding the subsidy for Transjakarta, as well as Integrated Rail (MRT) and Cross-Line (LRT) Transportations.

Based on [6], the imbalance between supply and demand in the Indonesian transportation system triggered the potential for railway projects to increase significantly. Bapennas (National Development Planning Agency) also stated that the railway sector programs in the country consisted of 247 line, 23 electrification system signal, 9 overflow power transmission, and 2 electrical substation projects [7]. However, proved that during the 2015-2019 RPJMN (National Medium Term Development Plan)[7], the railway sector experienced difficulty in achieving its development targets, as shown in Table 1.

Table 1. Achievement of the main targets of the 2015-2019 RPJMN [7]

No	Infrastructure Type	Achievement Status
1	Generator capacity	Difficult to achieve
2	Electric radio	Achieved
3	Consumption per capita	Achieved
4	Steady road conditions	Achieved
5	National Road Development	Achieved
6	New Road construction since 2010	Achieved
7	Highway construction	Achieved
8	**Railroad length**	**Difficult to achieve**
9	Port Development	Achieved
10	Harbour dwell time	Achieved
11	Number of new airports	Achieved
12	On-time flight performance	Difficult to achieve
13	Reachable regencies/cities by broadband	Achieved

The development of railways in Indonesia is also expected to be continuously difficult without appropriate management systems [4]. Meanwhile, neighbouring countries such as Malaysia and Singapore have reportedly had well-integrated mass transportation systems [8]. Based on [9][10], one of the innovations in infrastructure investment financing was observed through the Transit-Oriented Development (TOD) integrated with urban railway systems. As shown in Figure 1, the integrated development of the TOD-based railway transportation system is observed to increase accessibility to and from the area, leading to land price increase [11] .
The development of the TOD-based rail network concept with an identical financing scheme is also conducted through the Land Value Capture (LVC) model, according to [12], this LVC scheme is used to monetize infrastructure investment capital through an increase in land prices, regarding the development of new public facilities for commercialization purposes [11]. Also declared that a region or country considered the need for an integrated development concept in adopting the LVC model [9]. This consideration emphasized an optimal urban environment, as well as institutionally and societally reconsidering the valuation of the public transportation benefits.

In LVC financing schemes, one of the popular instruments is the management of tax increase differences (earmark), which emphasizes a Tariff & Fee-Based tool [13]. According to [12], the earmark mechanism was successfully applied in several countries through the various land price increase benefits caused by transportation infrastructure development. This instrument reportedly has a long history, including in Colombia (1921), Portugal (1562), England (1662), and Mexico (1607) [14]. Moreover, LVC is a non-traditional financing instrument for public facilities, where land is the main economical factor. This prioritizes the change in land use after being combined with infrastructure investment projects, which promotes economic value and productivity [2][15][16][17]. Regarding the success targets of the LVC scheme, [4] introduced "Triple Win LVC", as shown in Figure 2. This tool consists of better urban mobility increase, subsidy use reduction, and additional fiscal space.

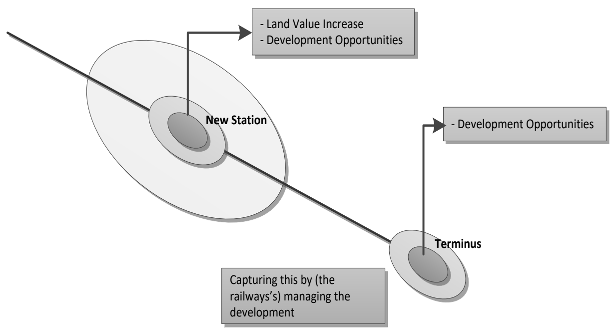

Figure 1. TOD-based Rail Network Development [10]

Figure 2. Virtuous Value Cycle Concept [4]

The success of the LVC scheme was explained, especially the earmarks instrument [10][18]. The scheme was implemented in railway infrastructure financing, especially the MTR (Mass Transit Railway) in Hong Kong, through a comprehensive integrated partnership between the property sector and the transportation mode. [4] in [2] also stated that the LVC scheme was applied in two great potential Indonesian regions, namely Jakarta and Makassar, by using earmarks. This showed that both regions had a significant Regional Original Revenue (PAD), which was obtained from taxes. In addition, [4] believed that the country had a great opportunity to implement LVC schemes through the earmarks instrument. According to [16], this implementation opportunity was not supported by the presently available instruments, such as the TDR (transfer development right) with land consolidation, including the inadequate comprehensive harmonization blueprint for TOD in urban areas. This was subsequently exacerbated by the unclear definition of institutional TOD authority, especially when linked to the cross-administrative issues caused by regional autonomy.

Based on these descriptions, an analysis is needed regarding the exploration of implementing the LVC scheme, especially the earmarks instrument. This urgent need is due to the government's lack of fiscal capacity in achieving the infrastructure development capable of improving the national economy. The urgent experimental need is also because of the limitations of the previous reports to only the conceptual analysis and modelling of land price forecasting around the station.

Therefore, this study aims to determine the reliability of alternative financing for the Land Value Capture (LVC) scheme in Indonesia, especially through earmarks. The results obtained are expected to fill the problematic gaps observed from previous literature. It is also expected to ultimately provide input to the government, to increase trust in exhibiting new funding sources through the development of railway infrastructure project areas. This leads to the ability to attract state/private investors, toward active participation in the development of the national railway network.

2. Method

To calculate the potential value of LVC through the increase in earmarks, the following steps were used,

a. Land Price/NJOP forecasting model development, To analyze the data through direct measurement, field survey, and secondary data, by using statistical methods to develop a forecasting model for NJOP value. The result obtained is a mathematical equation model for each station.

b. LVC calculation, To explain the simulation step with the previously compiled mathematical model. This calculation led to the difference in land value before and after development. Subsequently, the next step is conducted by adopting the calculation formula for Land & Building Tax (PBB) and is modified for LVC estimation with an earmarks mechanism.

2.1 Location & Sampling

To produce the analysis reflecting the real situation, a specific actual KPBU (Government Cooperation with Business Entities) project was selected as the case study, namely the Jakarta Loopline. In this analysis, only a population of 21 stations was used, as displayed in Figure 3.

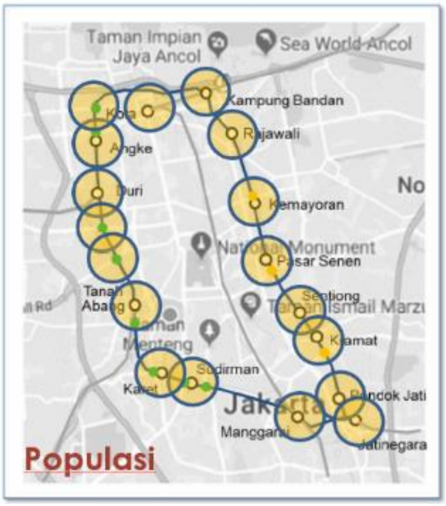

Figure 3. Study Sample Population

The obtained sample also emphasizes previous reports, such as the area most affected by the presence of railway transportation [1][19]. Regarding the impact of the metro station on the property prices around the area within a radius of 500 m, the calculation is shown in Figure 4.

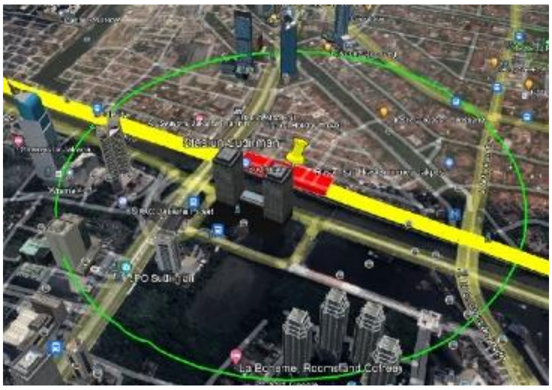

Figure 4. Sampling

The number of samples obtained also aligned with the analyses of [20][21], where greater selection values from the population size were better. However, a minimum limit was considered, especially through statistical analysis methods, namely **30** samples. From this context, the total number of samples selected for this experimental performance is **630**.

2.2 Study Stages

This is quantitative deterministic analysis, which uses numerical calculations to determine the decisions made by policymakers. To be more systematic in experimental performances, Figure 5 is presented as a derivative of analytical questions, which are in the following forms, (1) data sources, (2) data collection patterns, and (3) the methods used in conducting the analysis.

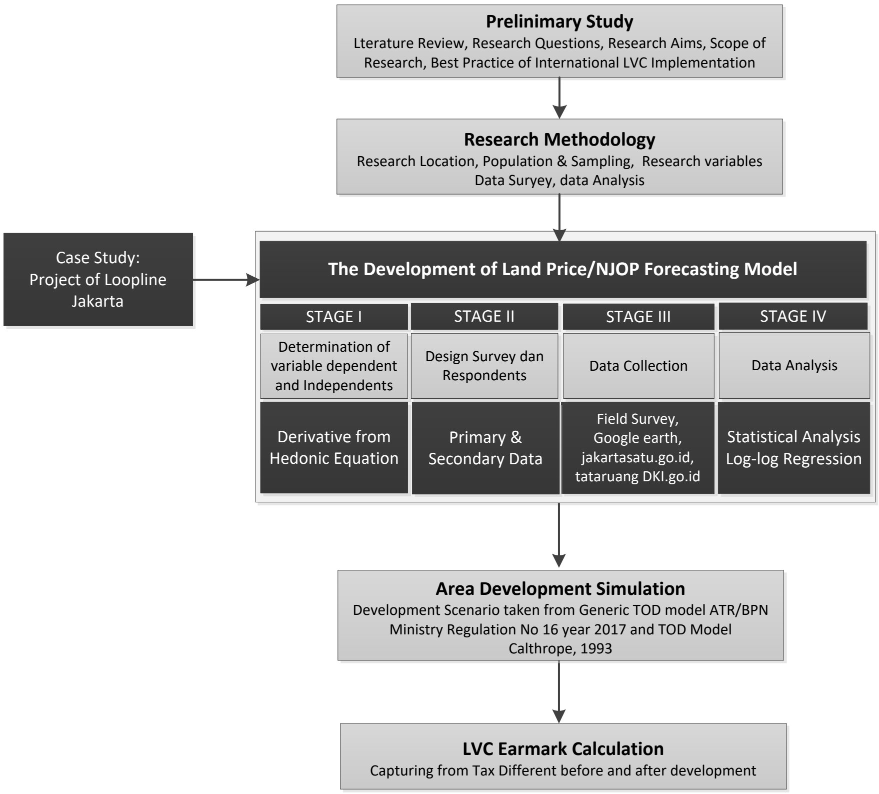

Figure 5. Study Stages

2.3 Data Source

According to [11], the Hedonic Pricing Model (HPM) method estimated the contributions of different predictor variables to a measurable land price indicator. Based on Equation 1, the HPM model is a function containing 3 main factors, which function in determining land prices, namely physical/structural (*S*), environmental (*N*) and location (*L*) factors.

$$p = f(L, S, N) \quad (1)$$

where p is land market price, L is location of land and buildings, S is Structure/Physical land and buildings, N is Environment.
Some experimental variables were also derived from the three main factors and were appropriately explained until the measurement process. Table 2 presents the variables derived from these factors in the HPM equation, by using the field survey/measurement method.

The data collection technique was divided into 2 (two) types, namely primary and secondary. Firstly, the primary data were obtained based on direct field measurements, such as the distance from the land to the station and the road width. Besides this, the land area was measured by using Google Earth. Secondly, the secondary data included the land prices around the station, which originated from the NJOP values within the surroundings in 2021, according to the Regional Revenue Agency of Jakarta. Other data subsequently included the parcel form, the KLB (Floor Area Ratio) value, and the site zone obtained by Likert scale and through the website, tataruang.jakarta.go.id. Figure 6 shows the sample derived through a radius of 500 m from each station's central point.

Table 2. Experimental Variables for Land Price (NJOP) Forecasting Modeling

HPM Factor	Research Variable	Description
Accessibility	- (X1) Residential Distance,	- Distance of residential parcel to the station central point (m)
	- (X2) Office Distance,	- Distance of office parcel to the central point of the station (m)
	- (X3) Commercial Distance,	- Distance of commercial parcel to station central point (m)
	(X4) Road Width	-Width of the access road to the station (m)
Structural	- (X5) Area,	- Perceel area (m^2)
	- (X6) Perceel shape,	- Perceel Shape (Scale 1-5), where scales 5 and 1 show a square and an irregular form, respectively.
	(X7) KLB	- Floor Area Ratio (Scale 1-5), where scales 5 and 1 indicates shows a high and low KLB value, respectively.
Environment	(X8) Zone	- Land Use Zone (Scale 1-5), where scales 5 and 1 are the commercial and residential areas, respectively.

2.4 Data Analysis

Logistic regression was used as the analytical method because the data types were mixed. This was similar to [11], where the log of the dependent variable was regressed against that of the independent determinant. Meanwhile, the non-metric variables expressed with Likert scale values were not transformed as logs.

Also indicated that in relative conditions, the logarithmic model enabled the calculation and measurement of the independent variable effects on the dependent factor [11]. The coefficient of the independent variable transformation into a logarithmic expression also emphasized its elasticity value, although the constant estimation (a) of the model occurred when all the rates of this factor = were 0.

Based on the results and experts such as [11] and [21] a forecasting model was formed for the land prices around the station, through the following regression Equation 2.

$$\text{Log (NJOP)} = a + b_1 log\text{ (Residential distance)} + b_2 log\text{(Office distance)} + b_3 log\text{(CBD distance)} + b_4 log\text{ (road width)} + b_5 log\text{(Perceel Area)} + b_6\text{(Shape)} + b_7\text{(KLB)} + b_8\text{ (Environment)} + e \quad (2)$$

Where a is constant, $b_{1,\ldots,5}$ is elasticity, $b_{6,\ldots,8}$ regression coefficient, e is *error*.

Figure 6. Plotting Determination of Sample Data (above) & Activity Data Survey (below)

Figure 7 illustrates the steps to obtain the best multiple regression model. This indicates that the linear regression analysis step is used to analyze the direct impact of one or more independent variables on a dependent factor, through SPSS version 22.0 (Statistical Package for the Social Science).

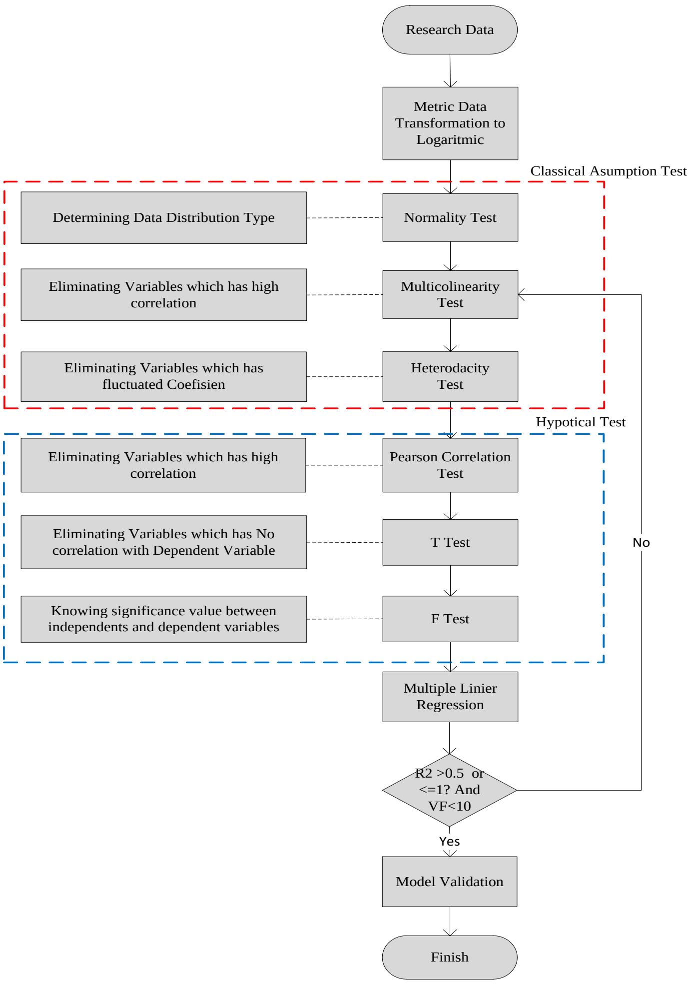

Figure 7. Model Development with Multiple Linear-Log Regression

2.5 LVC Value Calculation

This step was used for calculating the value obtained through the development of areas around the stations. In this case, the value was observed to automatically change the land use in each of the station surrounding regions. The scenario of the regional design was also modified from the Transit Oriented Development (TOD) concept found in the Minister of Agrarian Affairs and Spatial Planning/National Land Agency Regulation No. 16 of 2017. It was also modified from the generic land enhancement concept of Transit Oriented Development (TOD) developed by [22] as shown in Figure 8.

Figure 9 illustrates the systematic steps of the regional development simulation, to obtain maximum values due to the enhancement program around the station. From this context, the use of the term, "maximum", shows that the values contained in the land value are appropriately ideal. This is to determine the level by which the LVC value of the highest earmarks was contributed to replace the Public Service Obligation (PSO) coefficient subsidized by the government. Therefore, the analysis of the policy combinations capable of maximizing the substitution rate of PSO was possible at the end of the experiment.

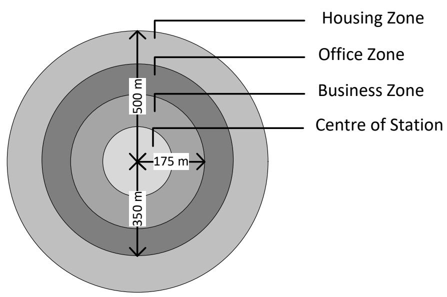

Figure 8. TOD Area Development Scenario

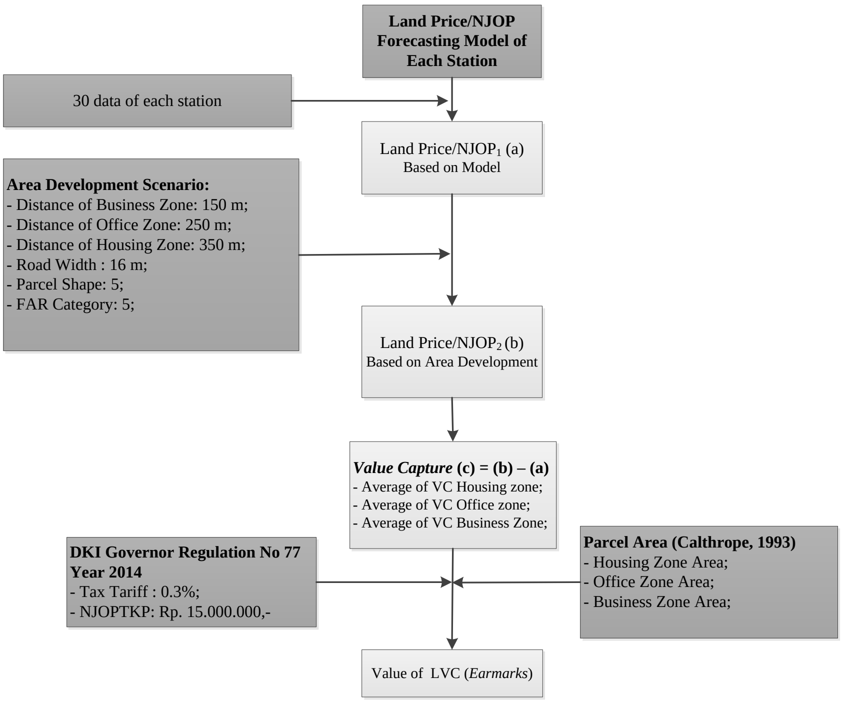

Figure 9. Simulation Stages To Obtain LVC Values

The calculation of LVC value prioritized the estimation in Governor Jakarta Regulation No. 77 of 2014, by using the land tax increase difference management mechanism, as shown in Equation 3.

$$PBB = TP \times \sum_1^n \left((NJOPT \times AT) \right) - NJOPTKP) \quad (3)$$

Since this analysis only assumes land, the LVC calculation equation then becomes the following,

$$LVC = TP \times \sum ((Zone\ VC\ Average \times Zone\ Area) - NJOPTKP) \quad (4)$$

Where *PBB* is the amount of *PBB* tax, *TP* is percentage tax rate (around 0.3%), *n* is n-th station, *NJOPT* is selling value of taxable objects for land, *AT* is land area, *NJOPTKP* is selling value of non-taxable objects (set at IDR 15,000,000),

3. Result

Based on the results, the following equation is an example of the final land price/NJOP forecasting obtained as the best model. This emphasized the experimental data for Mangga Dua Station, after conducting all the required iteration stages.

$$\text{Log (NJOP)} = 12.910 - 0.101\log(\text{Office Distance}) - 0.114\log(\text{CBD Distance}) + 1.033\log(\text{Road Width}) + 0.057\log(\text{Plot Area}) + 0.521(\text{KLB}) + 0.267(\text{Environment}) \quad (5)$$

From Equation 5, some variables were interpreted as follows, 1) **a = 12,910.** This indicated that the Land Price/NJOP was 12,910 units (in logarithm form) when the independent variable was zero (0). From this context, the NJOP was IDR 404,335 when the units were converted into a normal and constant value in the equation; 2) **b2 = -0.101.** This proved that the Land Price/NJOP decreased by 10.1% when the office distance increased by one unit, with the other variables constant. In this process, an inversely proportional relationship was observed between the distance of the office to the station and NJOP. From this context, the closeness of the office to the station caused a more expensive land price; 3) **b3 = - 0.114.** This result demonstrated that the Land Price/NJOP decreased by 11.4% when the CBD distance increased with other constant variables. In this case, an inversely proportional relationship was found between the distance of the CBD to the station and NJOP. From this interpretation, the closeness of the CBD led to a more expensive land price; 4) **b4 = 1.033.** This confirmed that the land price/NJOP increased by 103.3% when the road width was elevated with other constant variables. Regarding this context, a directly proportional relationship was observed between the width of the road and NJOP. In this case, wider road access to the station caused a more expensive land price.

Table 3 presents the analysis of land price/NJOP model development for all station areas through iterations, to obtain the best model according to the provided stages. Meanwhile, Table 4 provides the validation stage including the analysis of significance through the T-Test on the models at each station. The simulation of regional development also showed that its pattern was regulated by the zone network in the Concentric Zone Theory, as shown in Figure 8. This simulation was carried out by using the site establishment concept regulated by the TOD model in the Minister of Agrarian Affairs and Spatial Planning/National Land Agency Regulation No. 16/2017. The establishment also complied with the Transit-Oriented Development (TOD) principle developed by [22].

Based on Figure 10, the regional development around the station had the greatest impact on the VC values in Sudirman, Kemayoran, Kampung Bandan, and Kampung Melayu, at IDR 96 million, IDR 77 million, IDR 54 million, and IDR 52 million, respectively. In historical data of NJOP value in the Sudirman station area (2015-2021), a wide difference was observed from one neighborhood to another, with the highest being in the Karet Semanggi area at IDR 137 million/m^2/year.

In reality, the land use in Sudirman station is very complete, including the residential areas, especially in the form of apartments, luxurious offices, and business/trade centres, such as SCBD (Sudirman Central Business District). Moreover, the lowest NJOP value in this area was about IDR 16 million/m^2/year within the Karet Kuningan neighborhood. The reason for the high-Value Capture (VC) is also due to the wide range of NJOP values. In the simulation stage, the independent variable model of land forecasting was subsequently filled with a similar maximum value, leading to the present connection of Sudirman station to the MRT terminal and all transportation modes in Jakarta. This station was close to the Transjakarta Busway corridors 1 (Blok M-City), 4 (Dukuh Atas-Pulogadung), and 6 (Dukuh Atas-Ragunan). Its connection to the LRT Dukuh Atas station through a multi-use bridge was also planned in 2022.

Table 3. The Model of Land Price (NJOP) Forecasting for Each Station

No	Name of Station	Coefficient	Independent Variables							
			Housing Distance (X_1)	Office Distance (X_2)	CBD Distance (X_3)	Road Width (X_4)	Parcel Area (X_5)	Parcel Form (X_6)	FAR (X_7)	Environment (X_8)
1	Mangga Dua	12.910	-	-0.101	-0.114	1.033	0.057	-	0.521	0.267
2	Angke	16.323	-0.130	-0.124	-	0.066	0.002	0.005	0.089	-
3	Duri	15.423	-	-0.239	-0.067	0.631	0.011	0.008	0.062	-
4	Gedong Panjang	14.527	-	-0.044	-0.035	1.383			0.069	0.086
5	Jati Negara	15.987	-0.009	-0.006	-	0.015	-	0.004	-	0.224
6	Kampung Bandan	13.839	-	-0.003	-0.019	1.863	0.111	0.029	0.204	-
7	Kampung Melayu	14.740	-0.009	-	-0.028	1.529	0.014	0.085	0.048	-
8	Karet	15.242	-0.012	-0.078	-	0.906	0.054	0.018	-	0.270
9	Kemayoran	13.584	-0.059	-0.054	-	1.482	-	-	0.222	0.297
10	Kober	13.914	-	-0.034	-0.003	0.413	0.118	0.064	0.673	-
11	Manggarai	12.910	-0.084	-0.014	-	0.492	0.338	0.011	0.444	-
12	Menteng	14.627	-0.005	-0.004	-	0.370	-	0.061	-	0.533
13	New Kota	14.840	-0.024	-0.045	-	0.037	-	-	0.104	0.446
14	Pondok Jati	14.977	-0.007	-0.047	-	0.092	-	-	0.055	0.391
15	Pramuka	15.180	-	-	-0.017	0.030	0.038	-	-	0.435
16	Rajawali	16.236	-	-0.004	-	0.246	-	0.016	0.081	-
17	Sentiong	15.404	-0.050	-	-	0.346	0.108	0.198	0.253	-
18	Sudirman	16.105	-0.045	-0.027	-0.036	0.400	-	0.243	0.025	0.165
19	Tanah Abang	14.806	-	-0.018	-0.009	0.671	0.005	-	0.031	0.464
20	Tebet	14.960	-0.111	-0.016	-	0.483	-	0.099	0.409	-
21	Tomang	15.583	-0.001	-	-0.002	0.198	-	-	-	0.340

Table 4. The Summary of T-Test and Validation for Each Model Stasiun

No	Name of Station	Adjusted R2	Validation Test	Significance							
				Housing Distance (X_1)	Office Distance (X_2)	CBD Distance (X_3)	Road Width (X_4)	Parcel Area (X_5)	Parcel Form (X_6)	FAR (X_7)	Environment (X_8)
1	Mangga Dua	0.755	+4.42%/Class 1	-	0.004	0.001	0.000	0.434	-	0.153	0.001
2	Angke	0.712	13.02%/Class 2	0.000	0.000	-	0.689	0.969	0.842	0.181	-
3	Duri	0.878	-4,00%/Class 1	-	0.001	0.000	0.000	0.688	0.521	0.015	-
4	Gedong Panjang	0.898	27,52% / Class 3		0.001	0.004	0.000			0.712	0.279
5	Jati Negara	0.977	3,14% / Class 1	0.000	0.000	-	0.003	-	0.728	-	0.000
6	Kampung Bandan	0.823	22,05% / Class 3	-	0.003	0.002	0.002	0.100	0.515	0.003	-
7	Kampung Melayu	0.785	15,44% / Class 2	0.003	-	0.004	0.000	0.862	0.108	0.555	-
8	Karet	0.757	9,19% / Class 1	0.004	0.004	-	0.004	0.351	0.824	-	0.023
9	Kemayoran	0.949	17,21 % / Class 2	0.003	0.004	-	0.000	-	-	0.000	0.000
10	Kober	0.817	15,99% / Class 2	-	0.000	0.000	0.000	0.218	0.412	0.000	-
11	Manggarai	0.762	21,90% / Class 3	0.000	0.000	-	0.000	0.109	0.872	0.001	-
12	Menteng	0.939	15,35% / Class 2	0.000	0.000	-	0.000	-	0.090	-	0.000
13	New Kota	0.869	9,16% / Class 1	0.000	0.000	-	0.000	-	-	0.099	0.000
14	Pondok Jati	0.833	8,51% / Class 1	0.000	0.000	-	0.000	-	-	0.179	0.000
15	Pramuka	0.905	7,16% / Class 1	-	-	0.000	0.000	0.008	-	-	0.000
16	Rajawali	0.780	12,00% / Class 1	-	0.000	-	0.000	-	0.250	0.009	-
17	Sentiong	0.793	10,05% / Class 1	0.000	-	-	0.000	0.173	0.000	0.275	-
18	Sudirman	0.952	3,95% / Class 1	0.000	0.000	0.000	0.002	-	0.000	0.305	0.000
19	Tanah Abang	0.938	23,48% / Class 3	-	0.000	0.000	0.001	0.903	-	0.506	0.000
20	Tebet	0.859	10,37% / Class 1	0.000	0.000	-	0.002	-	0.008	0.064	-
21	Tomang	0.915	20,08% / Class 3	0.004	-	0.003	0.002	-	-	-	0.000

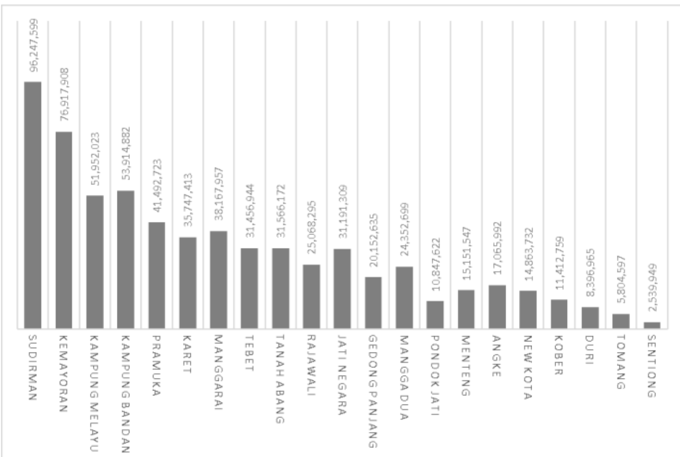

Figure 10. VC Value from Largest to Smallest

The increase in the land value/NJOP generally emphasizing each site use zone was obtained with the following range, 1) Increase in land prices for residential zones at IDR 696.8 thousand/m^2-IDR 30.5 million/m^2; 2) Increase in NJOP for office zones at IDR 1.25 million/m^2–IDR 41.4 million/m^2; 3) Increase in land prices of trade zone at IDR 595.9 thousand/m^2–IDR 24.4 million/m^2.

According to these results, the office zone occupied the highest position, accompanied by the residential and commercial/business areas. This was because of the far distances of the office and residential zones, compared to the closeness of the commercial zone. Therefore, a significant increase was found in land value/NJOP when the reorganization is observed, indicating that the two zones are closer to the station centre (walking distance radius). This was not in line with the business zone, which is already close to the centre.

Table 5. Summary of LVC Values for Each Station in the New Jakarta Loopline

No	Station Name	LVC Value (*Earmark* 0.3%)	% Tax Incremental
1	Angke	10,687,517,230	37.34%
2	Duri	7,028,537,397	33.60%
3	Gedong Panjang	16,658,830,200	59.85%
4	Jati Negara	17,474,789,545	45.67%
5	Kampung Bandan	41,154,370,867	48.58%
6	Kampung Melayu	42,266,347,037	57.57%
7	Karet	25,866,428,483	40.31%
8	Kemayoran	51,129,698,550	52.68%
9	Kober	8,775,979,089	32.41%
10	Mangga Dua	16,334,752,874	46.05%
11	Manggarai	25,852,384,651	62.75%
12	Menteng	11,567,122,731	30.23%
13	New Kota	9,656,991,474	11.19%
14	Pondok Jati	12,545,151,887	37.52%
15	Pramuka	26,002,537,509	53.14%
16	Rajawali	19,535,850,478	49.66%
17	Sentiong	2,056,612,664	9.01%
18	Sudirman	78,168,862,494	46.74%
19	Tanah Abang	21,311,193,680	28.13%
20	Tebet	24,288,043,917	47.26%
21	Tomang	3,579,537,640	7.02%
	Total	471,941,540,397	39.84%

Based on Table 5, the regional development around the station had the greatest impact on LVC value, in Sudirman, Kemayoran, and Kampung Melayu areas. In the NJOP data from 2015-2021, the land value in Sudirman station was very different from one neighborhood to another, with the highest value observed in the Karet Semanggi area at IDR 137 million/m^2/year. This was because the land use in the station was very complete, including the residential areas, especially in the form of apartments, luxurious offices, and business/trade centres such as SCBD (Sudirman Central Business District). Meanwhile, the lowest NJOP value in the Sudirman station was about IDR 16 million/m^2/year and was observed in the Karet Kuningan neighborhood. These two contrasting situations encouraged the high-Value Capture (VC) estimation, leading to the present connection of Sudirman Station to the MRT terminal and various transportation modes in Jakarta. Subsequently, this station was close to the Transjakarta Busway corridors 1 (Blok M-Kota), 4 (Dukuh Atas-Pulogadung), and 6 (Dukuh Atas-Ragunan). Its connection to the LRT Dukuh Atas station through a multi-function bridge was also planned in 2022.

From these results, Indonesia had a large potential to implement the LVC scheme through earmark instruments. In the country, taxes such as PBB, PBHTB, as well as hotel, entertainment, and parking tariffs were also applied as sources of LVC. However, preparations are highly needed, including a joint commitment between the Ministry/ Agency/regional government. The preparation of a long-term plan was also needed for the development of areas related to railway infrastructure development. This should be carried out through a transportation Master Plan having a clear land use strategy and VC (value capture) tax regulations. The plan also needs to be committed to multi-year budget allocation for project financing.

4. Conclusions

Based on the results, the following conclusions were obtained, that the land price forecasting model development stage showed that the dominant independent variables with the most significant contribution ($\alpha > 0.005$) to land price/NJOP were accessibility-related factors. The maximum value of the tax difference scheme from 21 stations had the potential to generate LVC earmark rates of IDR 471,941,540,397/year, for the New Jakarta Loopline route in the initial year of the project operation. Besides this, an average earmark of 39.84% was also found in all stations. These results proved that Indonesia had a large potential to implement the LVC scheme through earmark instruments. However, the protective regulations of the scheme application are needed, especially the institutional issues focusing on the capabilities of each agency in their respective region. It also emphasizes coordination issues due to the regional autonomy regulations causing policy implementation differences.

The potential of the LVC value should be used as an elimination rate or a substitution for the tariff subsidies (Public Service Obligation) often issued by the government through the Regional Budget. The best practices in the implementation of LVC earmark schemes were also successful in financing railway infrastructure networks, such as the MTR (Mass Transit Railway) in Hong Kong. In this case, the funding process was performed through an integrated partnership concept between the property and the railway sectors, leading to a comprehensive master plan. From this context, the concrete impact indicated that the MTR in Hong Kong became the backbone of urban transportation infrastructure, through the performance of 5.8 million trips per day.

References

[1] E. C. Cengiz and H. M. Çelik, "Railway Financing Via Urban Development," in *Urban Transport XXIV*, WITPress, 2019, pp. 209–218. doi: 10.2495/UT180201.

[2] Muhyiddin and H. Nugroho, "Indonesia Development Update A Year of Covid-19: A Long Road to Recovery and Acceleration of Indonesia's Development," *Jurnal Perencanaan Pembangunan The Indonesian Journal of Development Planning*, vol. 5, no. 1, pp. 1–19, 2021, doi: 10.36574/jpp.v5i1.

[3] C. M. Firdausy, "Potential Financial Instruments Toward Sustainable Urban Infrastructural Development in Indonesia," *Int. J. Critical Infrastructures*, vol. 14, no. 4, pp. 295–310, 2018.

[4] Asian Development Bank, "Innovative Infrastructure Financing through Value Capture in Indonesia," 2021.

[5] L. Affuso, J. Masson, and D. Newbery, "Comparing Investments in New Transport Infrastructure: Roads versus Railways? ," *Institute for Fiscal Studies*, vol. 24, no. 3, pp. 275–315, 2003.

[6] U. Annisari, "Critical Factors in Public Private Partnership Projects for Railway Projects in Indonesia-(Case Study: Comparison of Solicited and Unsolicited Proposals)," *United International Journal for Research & Technology*, vol. 02, no. 8, pp. 181–191, 2021.

[7] Badan Perencanaan Pembangunan Nasional, *Rencana Pembangunan Jangka Menengah Nasional (RPJMN) 2020 - 2024*, 1st ed. 2019.

[8] J. McIntosh, P. Newman, R. Trubka, and J. Kenworthy, "Framework for land value capture from investments in transit in car-dependent cities," *J Transp Land Use*, vol. 10, no. 1, pp. 155–185, 2017, doi: 10.5198/jtlu.2015.531.

[9] H. Suzuki, J. Murakami, Y.-H. Hong, and B. Tamayose, *Financing Transit-Oriented Development with Land Values: Adapting Land Value Capture in Developing Countries*. The World Bank, 2015. doi: 10.1596/978-1-4648-0149-5.

[10] I. Syabri, "The Influence of Railway Station on Residential Property Values-Spatial Hedonic Approach The Case of Serpong's Railway Station," *Jurnal Teknik Sipil*, vol. 18, no. 3, pp. 191–300, 2011.

[11] M. A. Berawi, N. Suwartha, K. Kurnia, Gunawan, P. Miraj, and A. R. B. Berawi, "Forecasting the land value around commuter rail stations using Hedonic price modeling," *International Journal of Technology*, vol. 9, no. 7, pp. 1329–1337, Dec. 2018, doi: 10.14716/ijtech.v9i7.2589.

[12] D. N. Tufail and P. Dirgahayani, "Identifikasi Potensi Land Value Capture di Kawasan Stasiun Gedebage Menggunakan Hedonic Pricing Model," *CSID Journal of Sustainable City and Urban Development*, vol. 1, no. 2, pp. 13–21, 2018.

[13] M. O. Smolka, *Implementing Value Capture in Latin America : Policies and Tools for Urban Development*. Lincoln Institute of Land Policy, 2013.

[14] Sitharamaraju K, B. S. Kumar, A. S. Yelne, and S. Narayanaswami, "Public-Private Partnership (PPP) in Indian Railways: Models, Framework, and Policies," 2020.

[15] A. G. Blanco B, N. M. Moreno, D. M. Vetter, M. F. Vetter, S. Moreno, and F. Herrera, *The Potential of Land Value Capture for financing urban projects: methodological considerations and case studies*. 2016. [Online]. Available: www.ph3estudio.com

[16] L. C. Walters, "Land Value Capture in Policy and Practice," *Journal of Property Tax Assessment & Administration*, vol. 10, no. 2, pp. 5–21, 2013.

[17] R. Cervero and J. Murakami, "Rail and Property Development in Hong Kong: Experiences and Extensions," *Urban Studies*, vol. 46, no. 10, pp. 2019–2043, Sep. 2009, doi: 10.1177/0042098009339431.

[18] E. Chi-Man Hui, V. Sze-Mun, and D. Kim-Hin, "Land Value Capture Mechanisms in Hong Kong and Singapore: A Comparative Analysis," *Journal of Property Investment & Finance*, vol. 22, no. 1, pp. 76–100, Feb. 2004, doi: 10.1108/14635780410525153.

[19] A. Lari, D. Levinson, Z. Zhao, and M. Iacono, "Value Capture for Transportation Finance," Minnesota, 2009.

[20] J. Adisantoso, "Model Log-Linier dan Regresi Logistik," 2010.

[21] T. Fujiyama, *Urban Railway Business Management*. Department of Civil, Environmental and Geomatic Engineering, 2019.

[22] P. Calthorpe, *The Next American Metropolis*. Princeton Architerctural Press, 1993.