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Property Tax in Indonesia: A Proposal for Increasing Land and Building Tax Revenue Using the System Dynamics Simulation Method

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ABSTRACT

The current hottest issue in Indonesia is the small amount of Land and Building Tax (LBT) revenue at the national and local levels. This research aims to find a valuable model for increasing LBT revenue for the government by formulating ideal clauses and determining what policies should be implemented. This research aims to reveal the practice of tax avoidance and evasion on LBT tax objects, which causes LBT income to stagnate yearly, and find a solution by mapping actual conditions and forecasting the next ten years using a system dynamics model. The research question is why LBT makes a small contribution to total state revenue, even though the object and what are the solutions to increase LBT income in the future. The research methodology uses quantitative methods supported by qualitative analysis using dynamical system modeling. This modeling makes it possible to predict increases in tax revenues by considering several variables that cause LBT revenues to stagnate. The findings of this study show that LBT revenues will proliferate compared to revenues in the initial year of the simulation if intervention is carried out by reducing tax avoidance and tax evasion, increasing tax compliance, and the value of the income growth ratio per tax object. This study found nine actors essential in increasing property taxes in Indonesia: civil officials, tax officials, tax authorities, notaries, large companies, state and regional-owned enterprises, sellers, and buyers of property. In conclusion, the government needs to improve the tax collection system and implement various strategies, including increasing the role of notaries to prevent tax evasion in housing.

KEYWORDS

tax governance, land and building tax, tax evasion, tax compliance, system dynamics model

JEL E62, E63, H21

УДК 336.22

Имущественное налогообложение в Индонезии: предложение по увеличению поступлений от налога на землю и строительство с использованием системно-динамического моделирования

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АННОТАЦИЯ

В настоящее время острой проблемой в Индонезии является небольшой объем поступлений от земельного и строительного налога (LBT) на национальном и местном уровнях. Данное исследование направлено на поиск адекватной модели увеличения доходов правительства от LBT путем формулирования идеаль-

ных положений и определения того, какая политика должна быть реализована. Целью данного исследования является выявление практики уклонения от уплаты налогов по объектам налогообложения LBT, приводящей к ежегодной стагнации доходов LBT, и поиск решения путем картирования фактических условий и прогнозирования ситуации на ближайшие 10 лет с использованием модели системной динамики. Исследовательский вопрос заключается в том, почему LBT формирует незначительный вклад в общий доход государства и какие существуют решения для увеличения доходов от LBT в будущем. Методологическую основу исследования составили количественные методы, подкрепленные качественным анализом с использованием системно-динамического моделирования. Это моделирование позволяет прогнозировать увеличение налоговых поступлений с учетом нескольких переменных, влияющих на величину доходов от LBT. Результаты исследования показывают, что доходы от LBT будут расти по сравнению с доходами в начальный год моделирования, если вмешательство будет осуществляться путем сокращения уклонения от уплаты налогов, улучшения налогового законодательства и роста налога на все объекты налогообложения. Исследование идентифицировало девять субъектов, играющих важную роль в повышении фискальной значимости имущественного налогообложения в Индонезии: государственные и налоговые чиновники, налоговые органы, нотариусы, крупные компании, государственные и региональные предприятия, продавцы и покупатели недвижимости. В статье обосновывается, что правительству необходимо совершенствовать систему сбора имущественных налогов и реализовывать различные стратегии, в том числе повышать роль нотариусов для предотвращения уклонения от уплаты налогов в жилищном строительстве.

КЛЮЧЕВЫЕ СЛОВА
налоговое управление, земельный и строительный налог, уклонение от уплаты налогов, налоговый комплаенс, модель системной динамики

1. Introduction

The current hottest issue in Indonesia is the small amount of Land and Building Tax (LBT) revenue at the national and local levels. In 2022, LBT tax revenue was less than 2% of total state revenue. Since its promulgation in 1985, an LBT has only contributed between 0.86–1.3%.

According to the Minister of Finance quoted by Cindy[1], LBT collected by the national Government in 2022 grew 59.5% (y-o-y) compared to the previous year. However, the 59.5% figure is actually only 1.23% of total state revenue.

The National Government collects the largest portion of tax objects, including plantation, forestry, mining, geothermal mining, mineral and coal mining, water and sea areas, toll roads, fisheries, aquaculture, pipeline networks, cable networks, storage, and processing facilities. This tax object is managed by large national private companies, foreign companies, State-Owned Enterprises (SOE), and Regional-Owned Enterprises (ROE). Katadata.co.id[2] an online newspaper trusted by the government, said that all of this would have an impact on reducing the mining tax sector by around 43%.

The stagnation of LBT income – it is thought that the cause is tax practices that do not support conditions towards improvement. The large number of tax evasion cases in the real estate, housing, forestry, plantation, and mining sectors is a significant cause. MUC Consulting[3] revealed that these issues are related to an ineffective tax collection administration system, resulting in a reduced level of tax compliance to 61–71%.

At the regional level, the stagnation of LBT income is caused by many things.

[1] https://databoks.katadata.co.id/datapublish/2023/02/24/penerimaan-pajak-negara-tembus-rp162-t-pada-awal-2023-ini-sektor-penyumbang-terbesar

[2] https://databoks.katadata.co.id/datapublish/2021/03/03/pajak-dari-sektor-tambang-turun-43-pada-2020

[3] https://mucglobal.com/id/news/3117/di-bawah-target-per-31-maret-2023-rasio-kepatuhan-formal-pajak-hanya-6180

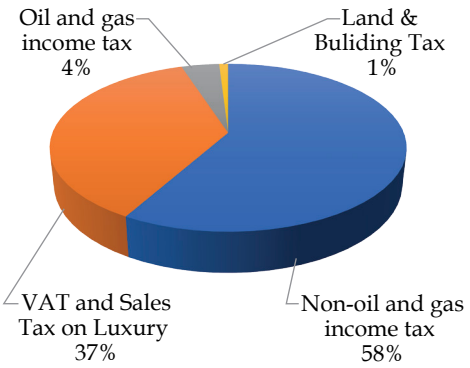

Figure 1. Percentage of LBT Revenue compared to other Central Taxes

For example, tax avoidance or evasion practices occur in the real estate, housing, forestry, plantation, and mining sectors. The low role of the tax authorities where the local government delegates authority to sub-districts to collect taxes using the target system[4] reported that the stagnation also occurred because of local government policies to reduce taxes owed and not provide tax sanctions to taxpayers who evade taxes.

The low percentage of LBT revenues at the national level also occurs at the City and Regency levels. The average realization of LBT revenues is only 2.9% of total local tax revenue. Of the 416 Regencies and 98 Cities in Indonesia, only Jakarta Province reaches 29%. Figure 1 depicts the position of LBT which only contributes 1.23% to state revenue.

The research question: why does LBT make a small contribution to total state revenue, even though it has wider tax object more taxpayers? Are there ways and methods to increase LBT revenues in the future?

The hypothesis is:

H1: The lack of LBT income is caused by the low tax compliance of taxpayers.

H2: If the potential for tax losses is high (measured from tax avoidance and tax evasion), then LBT revenues will decrease significantly.

H3: If tax compliance increases and tax evasion decreases, then LBT revenues can be increased as expected.

This research aims to reveal the practice of tax avoidance and evasion on LBT tax objects, which causes LBT income to stagnate yearly, and find a solution by mapping actual conditions and forecasting the next ten years using a system dynamics model.

2. Literature Review

The Oslo Dialogue, a strategy launched in 2011, formulated an approach primarily to combat tax crimes, set standards, share best practices, and build capacity. The process is called the OECD[5] Ten Global Principles, which relate to a number of practical tools, guidelines, training, and other capacity building supported by a legal framework related to financial transparency, strong institutions, and practical cooperation between tax administration and other law enforcement authorities. Tax theory calls this crime tax fraud, and tax fraud is related to tax corruption. According to Alm et al. [1], tax evasion is also considered a corrupt behavior.

Fiorino & Galli [2] stated that corruption is considered to create inefficiency and is proven to reduce investment and economic growth. Corruption tends to occur in countries with low economic growth.

Basem & Saeh [3] warn of the difficulty of limiting tax corruption that may be economically beneficial. According to him, tax fraud is an act of tax violation that is carried out intentionally with the intention of reducing the amount of tax that should be paid or deliberately providing incorrect information in the tax report to reduce the tax burden.

Tax evasion which leads to crime, and tax aggressiveness are included in the understanding of tax fraud. Tax evasion is a tax violation by carrying out a tax evasion scheme by reducing the amount of tax that must be paid or not paying tax. All this is done through illegal means. Tax evasion, tax avoidance, tax aggressiveness, and tax

[4] https://www.cnnindonesia.com/ekonomi/20230808073000-532-983215/pemprov-dki-beri-keringanan-bayar-pbb-sampai-akhir-tahun

[5] https://legalinstruments.oecd.org/en/instruments/OECD-Legal-0469

abuse cause quite large losses, which has an impact on the difficulty of calculating potential tax (loss tax potential). Loss tax potential occurs because an individual or company intentionally makes careless or deliberate inaccuracies by calculating any exaggeration that reduces the true impact of the tax payable.

Recently, scientific views highlighting the importance of carefully understanding the potential of taxes for the formation of budget revenues have grown rapidly.

Vasileva [4] explained that potential taxes depend more on the country's tax policy, applicable benefits, tax rates, tax base, and other indicators. Increasing central and regional economic strength through calculating tax potential can be determined by measuring the openness of access to taxable resources and further incentive and restrictive policies.

Mayburov & Kireenko [5] and Bikoula et al. [6] assert that a significant amount of tax potential is wasted when the government fails to control tax fraud.

Maksimchuk et al. [7] present the role of tax potential in stimulating innovation in the digital sector and review the advantages, disadvantages, and benefits of the existing taxation system in the Russian Federation. The conclusion is that more current benefits are needed to stimulate economic innovation without causing losses for the government due to tax avoidance aspects. They propose that tax benefits are a primary requirement for the growth of local tax potential in modern conditions and for stimulating innovation in the digital economy.

In the implementation of tax collection in regions in Indonesia, the minimal number of tax authorities results in less aggressive LBT tax collection. In contrast, regarding the property tax implementation in Singapore, the city government actively and aggressively employs it as an industrial policy and macroeconomic stabilization tool. There exists a close relationship between property taxes, public housing, and mandatory savings schemes. This scheme has replaced the mortgage financing market in Singapore. However, according to Asher & Nandy [8] what is interesting is the gap between the property tax treatment of public housing, which is lightly taxed, and the treatment of non-residential property, which is relatively more heavily taxed.

Indonesia does not implement the concept of this mandatory savings scheme, and property tax is considered very affordable. Even in Jakarta, three years ago, properties worth less than US$ 130,000 were exempted. A study by Gstach [9] analyzes a variant of the classic idea of property taxation based on the owner's self-assessment. To encourage market value reporting, tax authorities announced the random purchase of some properties at the declared value under certain conditions. Gstach discovered a tax game among these taxpayers where they all reported market values to tax authorities but did not purchase any property. In Indonesia, it is different; for a long time, the tax office has used newspapers and online sites where sellers offer property prices.

In a study by Pandya & Tippett [10] it is highlighted that in Australia, high house prices by global standards are prompting calls for the reform of the country's taxes. As per Freebairn [11], the call has raised concerns among policymakers that property tax reform might push home prices even higher. In Indonesia, since 1984, the government has yet to carry out tax reform. The government considers the condition of tax revenues to be stable by relying on Income Tax and VAT. Meanwhile, real estate and housing sales experienced a decline during and after COVID-19.

Concerning tax corruption, especially land and building tax, there are not many articles that reveal it. Perhaps the studies and perceptions found by researchers regarding tax evasion are considered dangerous and very vulnerable to political elites. However, we suspect this happens because it is difficult to obtain corruption data on LBT objects. The solution is to take and count case by case from reports in newspapers and the field, creating guidelines for exploring and finding relationships between corruption variables and then tracing them based on scientific analysis.

Quoted from a study conducted by Kurauone et al. [12] and Dowling [13], they revealed a relationship between decreasing tax revenues and corruption and tax evasion. Their study proposes controlling tax corruption by controlling taxpayers' tax avoidance efforts.

Pazhanisamy [14] conducted almost the same research. He offered the possibility of Ronald Coase's theory to control tax corruption and justified what interventions are needed to achieve the optimal amount of corruption. Their study concludes that to achieve optimal results (with the spread of corruption in society) all perpetrators of corruption must be internalized by introducing legal business and understanding tax compliance.

Based on this literature, tax corruption is a tax crime that can reduce investment and hinder innovative economic growth in the digital economy, potentially wasting tax potential if not significantly controlled by the government. The government can employ various methods to minimize tax evasion, tax avoidance, and tax aggressiveness on Land and Building Tax by understanding several important variables. One such variable involves reviewing the ten OECD Global Principles. Additionally, the government could consider a slight increase in tax deductions to encourage people to pay taxes, thereby reducing tax evasion.

3. Methodology

3.1. System Dynamics Simulation Model

This research method utilizes a quantitative approach supported by a dynamic system simulation model, referencing a mixed methods approach. Staadt [15] and Shin & Jeong [16] state that the application of a qualitative systems thinking approach (soft systems methodology) in operational processes is facilitated by using Power-sim constructor software as a cognitive mapping tool, aimed at formulating models with a quantitative systems thinking approach (system dynamics).

The primary objective of dynamic system analysis, according to Warren [17] and Şenaras [18], is to address three key questions: (why) LBT income is decreasing, (where) or at what position action must be taken to increase LBT income, and (how) to effect this change. The last question is more concerned with the policy to be implemented. It can be said that a dynamic system is a method for describing how a system changes over time.

In each model, the feedback structure is expected to incorporate several loops to meet the requirements of a comprehensive model. Models that have been tested multiple times will endure under various conditions, even in extreme scenarios (robust).

Esteso et al. [19] add that the model should also have multiple points of contact with the real world; repeated comparisons with the real world will enhance the model's robustness. Referring to system dynamics, the tendency of LBT income to increase, decrease in certain periods, and then increase again, as depicted in Figure 1, carries a specific meaning referred to as behavior or dynamics. This behavior arises from various factors, and in system dynamics, the focus is on predicting the future value or quantity of the variable.

3.2 Stock and Flow Diagrams

Stock and Flow Diagram (SFD) is a development of the Causal Loop Diagram (CLD). Zheng et al. [20] and Araya et al. [21] described a CLD is illustrated in a diagram comprising two types of variables, including stock (level) and flow (rate), to produce dynamic system modeling. Stock (Level) and Flow (rate) are used to represent activity in a feedback loop and a more detailed explanation of the causal loop diagram. An SFD is very concerned about paying attention to the influence of time on the relationship between variables so each variable can show the accumulated results of the variable level and the variable, which is the rate of system activity for each period known as Rate.

The stock variable (level) states the condition of the system for each Stock, which is an accumulation in the system, and the system level, which is better known as the state variable system. The stock variable is a policy structure de-

scribing why and how a decision is made under the information available in the system. Meanwhile, a Rate is a variable in the model that may influence the level.

3.3. Initial values and parameters

System dynamics modeling analysis helps generate relationships between parameters and components of air pollution reduction models. These relationships can be estimated and made into a scenario if the data is available in numerical form. Secondary data sources generally acquire Initial values and parameters. If secondary data is unavailable, this value can be estimated by processing supporting or numerical data on primary and secondary data.

To establish the model of relationships between variables, initial values must be determined as constants, function tables, and indicator levels. For instance, the LBT tax revenue index can be calculated from rates and constants, eliminating the need for complex initial value calculations. Therefore, as highlighted by Hekimoglu & Barlas [22], determining parameter values must take into account their effect on model sensitivity. In this case, changes in the structural model will appear more sensitive than the feedback model.

Therefore, estimates in this study are only made at the level of accuracy required in this study. For modeling purposes, this study will consider trends toward long-term changes, understanding the nature of system dynamics and alternative design policies. Therefore, behavioral and policy sensitivity will be prioritized. The initial values and parameters used in modeling are presented in the Table 1.

Table 1. Initial values and model parameters (2022)

No.	Indicators	Initial Value / Parameter (endogenous variable)	Unit	Source
A.	**General Information**			
1.	Number of LBT taxpayers	69,573,930	Unit	S
2.	Amount of LBT revenue	730,898,262	US$	S
3.	Taxable Tax Objects (Selling Value of Non-Taxable Tax Objects)	3,785	US$	S
4.	Forestry and Plantation Tax Operational Costs	5.4	%	S
5.	Mining, Cable network, Pipe, Toll Road Tax Operational Costs	6.3	Percent	S
6.	River, Sea, Cultivation, Storage Tax Operational Costs	6.3	Percent	S
7.	Normal rates	0.5	Percent	S
8.	Maximum Tax Object Sales Value Rate	40-100	Percent	S
9.	Assessment Value	20-40	Percent	S
10.	Average Tax Object Sales Value of Land	75,000	US$/meter	E
11.	Average Tax Object Sales Value of Buildings	100,000	US$/meter	E
12.	Average of National LBT growth ratio	12	Percent	S
13.	Average of Tax Compliance	70.6	Percent	E
14.	Average of Tax loss potential (Tax avoidance, Tax evasion)	14	Percent	E
B.	**Plantation Land and Forestry**			
15.	Area of Plantation and Forestry Objects	148,824,200	Hectare	S
16.	Amount of LBT revenue	122,606,044	US$	S
17.	Ratio of Forestry and Plantation LBT Income Growth	0.23	Percent	E
18.	Ratio of Forestry and Plantation LBT Tax Compliance	0.34	Percent	E
19.	Ratio of Forestry and Plantation LBT Tax Avoidance	0.09	Percent	E

End of Table 1

No.	Indicators	Initial Value / Parameter (endogenous variable)	Unit	Source
C.	**Mining**			
20.	Area of Mining Objects (Oil, Gas, Coal, Minerals)	6,423,898		
21.	Total revenue of LBT Mining	730,898,262	US$	S
22.	Ratio of Mining LBT Income Growth	0.20	Percent	E
23.	Ratio of Mining LBT Tax Compliance	0.11	Percent	E
24.	Ratio of Mining LBT Tax Avoidance	0.07	Percent	E
D.	**River/aquatic, Marine/Sea, Cultivation, Storage**			
25.	Area of Production Objects	191,112,434	Hectare	S
26.	Amount of LBT revenue	111,812,940	US$	S
27.	Ratio of River, Sea, Cultivation, Storage LBT Income Growth	16	Percent	E
28.	Ratio of River, Sea, Cultivation, Storage LBT Tax Compliance	63	Percent	E
29.	Ratio of River, Sea, Cultivation, Storage LBT Tax Avoidance	6	Percent	E
E.	**Cable Network, Pipeline, Toll Road**			
30.	Length of Network of Cables, pipes, Toll Roads	5,812,545	km	S
31.	Amount of LBT revenue	730,898,262	US$	S
32.	Ratio of Cable Networks, Pipes, Toll Roads LBT Income Growth	17	Percent	E
33.	Ratio of Cable Networks, Pipes, Toll Roads LBT Tax Compliance	70	Percent	E
34.	Ratio of Cable Networks, Pipes, Toll Roads LBT Tax Avoidance	7	Percent	E
F.	**Rural**			
35.	Rural Area	1,892,555.47	Km2	S
36.	Total LBT Revenue	3,593,890	US$	C
37.	Ratio of Rural LBT Income Growth	15	Percent	E
38.	Ratio of Rural LBT Tax Compliance	68	Percent	E
39.	Ratio of Rural LBT Tax Avoidance	7	Percent	E
G.	**Urban**			
40.	Area of Cities/Urban	24,775.26	Km2	S
41.	Total LBT Revenue	447,137,758	US$	C
42.	Potential tax losses	29	Percent	E
43.	Ratio of Urban LBT Income Growth	14	Percent	E
44.	Ratio of Urban LBT Tax Compliance	67	Percent	E
45.	Ratio of Urban LBT Tax Avoidance	6	Percent	E
H.	**Scenario: Increase tax compliance and Decrease tax evasion**			
46.	Scenario 1	0	Percent	Sc
47.	Scenario 2	50	Percent	Sc

Abbreviation: LBT = Land and Building Tax; S = Obtained from secondary data; E = Estimation based on qualitative information; C = Calculated in accounting; Sc= Scenario model

These values are mostly obtained from secondary data and should be sourced from reputable references. Some values may be estimated based on reliable qualitative information (Schoenenberger et al. [23]).

3.4. Definitions and Variables

3.4.1. Taxpayer, tax subject, and object

An LBT taxpayer is an individual or company who can serve as a taxpayer, tax withholding, and collector who has the rights and obligations to perform taxation.

A tax subject is an individual inheritance that has not been divided as a single unit, company, or permanent establishment that can reside or be located in Indonesia or outside Indonesia.

Meanwhile, the tax object is the source of taxable income. A tax rate is the basis for tax imposition determined on a tax object and becomes the taxpayer's responsibility.

In this discussion, tax relief is not used as a variable because it is regulated by law. For example, state land that is excluded from LBT imposition. This variable is called exogenous and is not the subject of this research, but it can be intervened in other research models.

3.4.2. Rates, procedures, and assessment systems

The LBT rate is a percentage determined by the Government. The LBT tax rate is determined at 0.5% of the taxable sales value.

The basis for calculating Taxable Sales Value is defined at a minimum of 20% and a maximum of 100% of the Tax Object Sales Value. The Minister of Finance determines the selling value of tax objects every three years except for certain regions, which are determined yearly following local developments, such as Jakarta Province.

LBT may choose an implementable collection system, for example, a self-assessment system, an official assessment system, and a withholding tax system. However, LBT in Indonesia adheres to the official assessment system. The Official Assessment System is calculated and determined by the Directorate General of Tax.

Meanwhile, the Local Revenue Agency determines it at the city and regency government levels. Determining the amount of tax depends on the location and object, the owner or cultivator of the land based on land certificate data.

The procedure for collecting this is that taxpayers must fill out the Object Notification Letter form. The tax authorities issue a Tax Assessment Letter that includes the land area, building area, and assessment value. The assessment value is set at 20% for subjects who own land valued below US$ 63,000 and 40% for land valued above US$ 63,000.

3.4.3. Potential tax and tax losses

Tax potentials are the amount of tax that the Government can collect from the community plus those that cannot be collected for several reasons.

Potential tax losses are the amount of tax lost due to tax reductions and exemptions based on regulations, which are determined at 2.5% (tax relief). Potential tax losses are also caused by tax avoidance and tax evasion, with the average per tax object by 14%.

3.4.4. Forestry sector

The maximum limit for Taxable Tax Objects (Selling Value of Non-Taxable Tax Objects) at the City and Regency level is US$ 4,000. Tax Object Sales Value means the average price obtained from buying and selling transactions occurring naturally, and if there is no sale and purchase transaction determined by comparing prices with similar objects or new acquisition value or replacement Tax Object Sales Value. In its calculations, this LBT in the Forestry sector is divided into two types, namely natural forests and plantation forests.

3.4.5. Mineral and coal mining sector

The amount of payable LBT by the mineral and coal mining sector is calculated by multiplying the LBT rate with the Taxable Sales Value (TSV).

The LBT rate is 0.5%.

TSV is defined as 40% of the Tax Object Sales Value, which encompasses both land and buildings. The Tax Object

Sales Value for the land comprises the land's surface, and the Tax Object Sales Value for the explored land body is determined based on production operations.

The amount of Tax Object Sales Value for the land surface is calculated from the multiplication result between the area of the land surface and the Tax Object Sales Value per M^2.

The amount of Tax Object Sales Value for the explored land body is calculated from the size of the Mining Permit area multiplied by the Tax Object Sales Value per M^2.

The Tax Object Sales Value for the land body of production is calculated from the size of the Mining Permit Area multiplied by the Tax Object Sales Value per M^2.

The Tax Object Sales Value per M^2 is the conversion result of the land value per M^2 into the classification of Tax Object Sales Value for land. According to Duke & Gao [24] the value of the land is obtained based on the assessment results conducted individually and in bulk.

4. Research Results

4.1. Initial model flowchart

In the analysis of system dynamics, the construction of a flowchart necessitates the identification of variables and indicators. Figure 2 serves as the initial step to depict the actual state of land and building tax revenue, influenced by tax compliance and the growth ratio of LBT revenue.

The LBT tax revenue is denoted as Stock, while the LBT revenue growth ratio is represented as a loop (+), and tax compliance is designated as loop (–) or the Balancing loop. Given the current low tax compliance, it is classified as a loop (–), acknowledging the difficulty in achieving a compliance digit of 1.0.

The loop (+) representing the LBT revenue growth ratio is influenced by the assessment value, the LBT revenue growth ratio per tax object, the standard rate, and the TOSV rate. On the other hand, tax compliance is affected by the ratio of tax compliance, taxable tax objects, and potential tax losses. Notably, potential tax losses are observed to be influenced by tax avoidance, tax evasion, and tax relief.

4.2. Flowchart of the developed model

Figure 3 represents the development of a flowchart, which consists of eight segments designed to yield comprehensive and maximum calculation results. The first segment, referred to as flowchart 1, outlines the development of total LBT Income. It encompasses factors such as the number of taxpayers, tax object area, and rates. Stock-1 represents LBT Income,

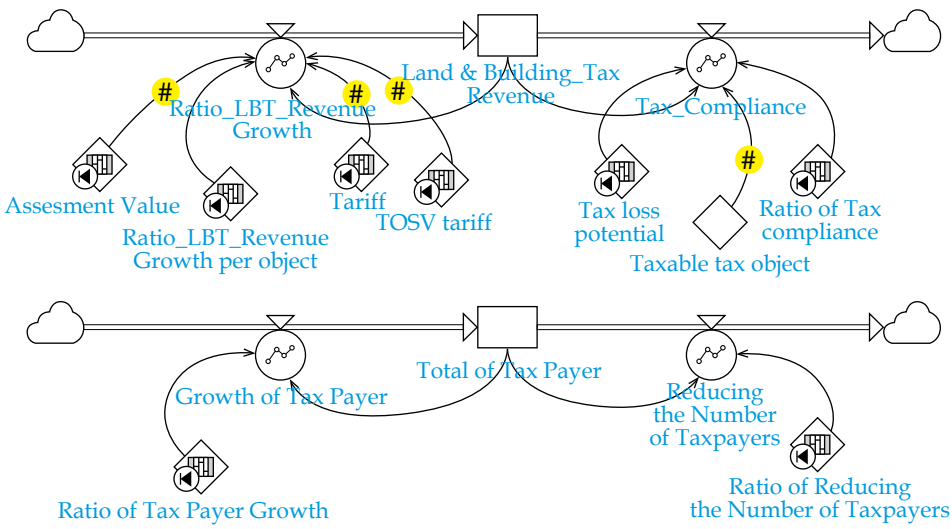

Figure 2. LBT and taxpayer variable flowchart

generating two loops: Loop 1 for LBT Revenue Growth and Loop 2 influenced by tax relief, tax avoidance, and tax evasion, which collectively contribute to tax loss potential.

In the flowchart (+), LBT's revenue growth is depicted to increase at an average rate of 30.12% per year based on a five-year average revenue. This assumption remains below national media reports, citing a growth rate of 59.5% in 2022. On the other hand, the flowchart (–) elucidates a balance indicated by potential tax losses attributed to tax relief, tax avoidance, and tax evasion, assumed to be 20% of LBT income.

The 20% figure is derived from calculations using the taxpayer compliance level formula, incorporating tax relief, tax avoidance level, and tax evasion. For a more detailed prediction of LBT income over the next 5-10 years, additional flowcharts for Tax Objects are essential. Multiple flowcharts for Tax Objects are detailed in Figure 3.

In flowchart 2, the Plantation and Forestry Tax Object is stated as Stock. Plantation Tax Objects comprise Cocoa, Tea, Sugarcane, Tobacco, Coffee, Rubber, and Coconut Land, which need to be calculated to increase an LBT income. The flowchart generates two loops. Loop 1 is an LBT Income growth in the Plantation sector, calculated based on tax operational costs (TOC). Loop 2 is represented by Tax loss potential influenced by tax relief, tax avoidance, and tax evasion. The Forestry Tax flowchart comprises productive and non-productive forest land. The flowchart generates two loops. Loop 1 is an LBT Revenue growth in the Forestry sector, calculated based on TOC. Loop 2 is represented by tax loss potential influenced by tax relief, tax avoidance, and tax evasion.

The 3rd flowchart is called Mining LBT Stock. The analysis discussed Oil and Natural Gas, Geothermal Mining, Minerals and Natural Gas, Mining, and Coal. The flowchart generates two loops. Loop 1 is

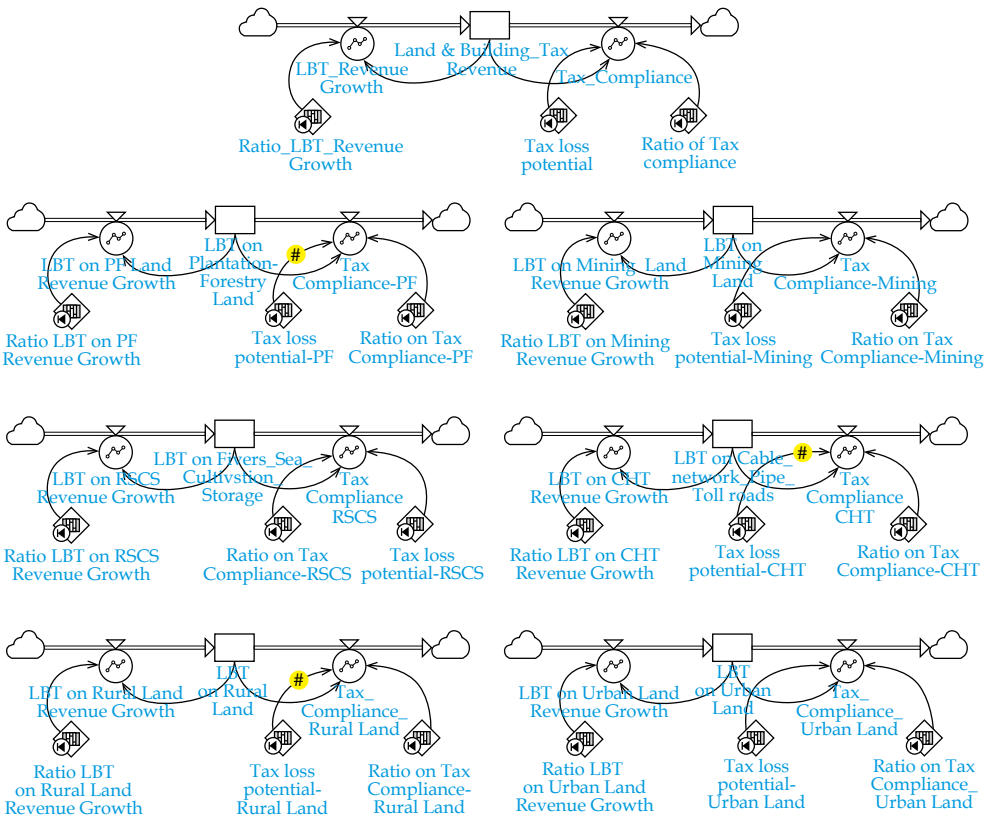

Figure 3. LBT variable flowchart

an LBT Revenue growth in the Oil and Gas Mining, Geothermal Mining, Mineral, and Natural Gas sectors, calculated based on TOC. Loop 2 is represented by tax loss potential influenced by tax relief, tax avoidance, and tax evasion.

The 4th flowchart is called an LBT Stock of Aquatic, Marine, Cultivation, and Storage. The flowchart generates two loops. Loop 1 is an LBT Revenue growth from the Aquatic, Marine, Cultivation, and Storage sectors, calculated based on TOC. Loop 2 is represented by Tax loss potential influenced by tax relief, tax avoidance, and tax evasion.

The 5th flowchart is an LBT Stock of Toll Roads, Cable Networks, and Pipes. The flowchart generates two loops. Loop 1 is an LBT Revenue growth from the Toll Roads, Cable Network, and Pipe sectors, calculated based on TOC. Loop 2 is represented by Tax loss potential influenced by tax relief, tax avoidance, and tax evasion.

The 6th flowchart is Rural LBT Stock. The flowchart generates two loops. Loop 1 is the growth of Rural LBT Income calculated based on TOC, and Loop 2 is represented by Tax loss potential, which is influenced by tax relief, tax avoidance, and tax evasion.

The 7th flowchart is an Urban LBT Stock. The flowchart generates two loops. Loop 1 is an Urban LBT Income growth calculated based on TOC, and Loop 2 is represented by Tax loss potential, which is influenced by tax relief, tax avoidance, and tax evasion.

4.3. Behavior modeling and test models

The Historical Behavior Test Model aims to determine whether the model corresponds to the actual system's historical behavior by comparing computer simulation results with on-site empirical data.

The validity criterion states that the developed model is deemed valid if the computer simulation results closely match and resemble empirical data. The implication is that a valid model serves as an effective experimental tool for analyzing government policies, particularly in predicting and analyzing income at the national, city, and regency levels.

The conclusive result of the conformity test indicates that the model's behavior aligns well with historical behavior, making it suitable for use as a foundation for long-term policy simulations.

Collectively, these tests provide a robust assessment of the model's reliability and its capability to simulate real-world scenarios, facilitating informed policy analysis and decision-making (Paine [25]).

4.4. Conformity statistical test model

The root mean-square percent error (RMSPE) and Theil inequality statistics were employed to assess the confidence level of the model in accurately representing actual behavior. Since system dynamics modeling does not directly utilize historical data for model construction, adjustments were made to the model size to align with real conditions (goodness-of-fit). Traditional significance tests used in econometric modeling were not deemed suitable for implementation in this context (Tezel et al. [26]).

RMSPE calculates the root-mean-square of the proportion of differences between simulated values and actual values (Narwane et al. [27]). On the other hand, Theil's inequality statistics break down the mean-square error (MSE) into components that measure the error parts caused by biased inequality proportion, variance proportion from inequality, and covariance proportion from inequality. The application of Theil statistics in model testing considered various factors. In order to apply Theil statistics in model testing, the following items were considered:

The statistical tests involved analyzing various errors and their characteristics to evaluate the model's confidence in replicating actual behavior. Here are the key points:

1. Big U^m; U^S, Small U^C. Indication: This points to an error attributed to bias, representing a systematic discrepancy between the model and reality or an error in determining parameter specifications.

2. Errors Caused by Inequality of Variance.

a) big U^S and Small U^m, correlated with U^C: Implies that while the mean is

the same, the mean variance differs. This suggests that simulated and actual values exhibit different trends;

b) big U^S, U^m = 0, and Small U^C: Suggests the presence of non-existent cycles in the simulated value.

3. Big U^C, U^m, Small U^S. Indication: Points to errors due to covariance inequality. This occurs when the simulated and actual average values are the same but differ in phases, requiring error correction.

In order to enhance the model's confidence in reproducing system behavior resembling real situations, it is crucial to minimize errors and discrepancies in U^C and U^S. Models with significant errors are considered unacceptable for producing reliable results (Naumov & Oliva [28]; Schoenenberger & Tanase [29]).

Acceptable error variables in this model are summarized in Table 2.

Table 2 presents the root-mean-square error (RMSPE) of the tested indicators, indicating systematic errors in comparing the model with reality. The significant U^S (Um and U^C) values suggest the presence of cycles that may not be captured in the simulated data, highlighting the influence of various factors on each variable. Some undisclosed data, such as unreported LBT income, contribute to these discrepancies.

The research findings reveal a decrease in LBT income by 0.0026 U^C, Plantation-Forestry Land by 0.0025, and Rural sector LBT by 0.0020 U^C. These values exhibit a tendency for imperfect variance (U^S) and high correlation but differ in mean-variance. Consequently, simulated and actual values will consistently differ, influenced by factors like changes in the number of taxpayers, occurrences of tax avoidance and evasion, increased tax relief, and potential tax havens based on future laws.

Despite errors, the statistical test results' conformity value is considered good, staying within tolerance limits for analysis (not exceeding a value of 1.0). Given the values remain below the tolerance limit, the analysis can proceed. The system dynamics performs two scenarios to assess the impact of low tax compliance and high potential tax loss.

The observed differences between simulated and actual values can be attributed to various factors, such as a decline in the number of taxpayers, instances of tax evasion and avoidance, increased tax breaks, or the emergence of tax havens influenced by future legislation. Similar research by Lin & Hsieh [30] in Ethiopia found that farmers' tax compliance was relatively low due to unfair treatment and a non-transparent administrative system. In conclusion, the goodness of fit of the statistical test results is deemed satisfactory for determining the validity of the model in replicating historical behavior (Qudrat-Ullah & Seong [31]).

4.5. Pessimistic Scenario

This scenario simulates the conditions of LBT income from 2022–2032 without any intervention (0%).

Over the last five years, the average LBT income was US$ 730,898,262, with a total of 69,573,930 taxpayers. The national tax compliance ratio averaged 70.60%,

Table 2. Statistical test results of model conformity

No.	Variables	RMSPE	Theil Inequality Statistics		
			U^m	U^s	U^c
1.	Amount of LBT revenue	0.0228	0.0001	0.0032	0.0026
2.	Plantation-Forestry Land	0.0220	0.0012	0.0031	0.0025
3.	Mining Land	0.0119	0.0003	0.0009	0.0005
4.	Water, Sea, Aquaculture, Storage	0.0148	0.0005	0.0014	0.0009
5.	Cable Network, Pipeline, Toll Road	0.0081	0.0001	0.0004	0,0001
6.	Rural Land	0.0021	0.0001	0.0025	0.0020
7.	Urban Land	0.0127	0.0004	0.0001	0.0006

while the city and district-level tax compliance ratio averaged 45.20%. The average annual growth ratio for LBT stood at 12%, accompanied by an average annual tax loss potential of 15% and an average annual tax compliance ratio of 71%. This simulation assumes a constant number of taxpayers and the area of taxable land, with no changes in government policy.

The results indicate that if the average tax compliance ratio remains at 71%, along with constant growth in the number of taxpayers, the projected increase in LBT income in the 10th year will only be 1.23%. This highlights that the contribution of LBT revenue remains relatively low compared to the average annual state revenue (Figure 4).

This scenario underscores the significant impact of tax compliance levels on LBT income. If compliance is low, it will lead to a reduction in LBT revenue. Therefore, the first hypothesis is validated by this simulation.

4.6. Optimistic Scenario

The optimistic scenario aims to create an information-based problem-solving model, as illustrated in Table 1, where all indicators contribute to the model. The goal is to develop a model that comprehensively describes predictions and anticipates potential outcomes.

In this research, the endogenous variable is expected to intervene in the model by reducing potential tax losses. The

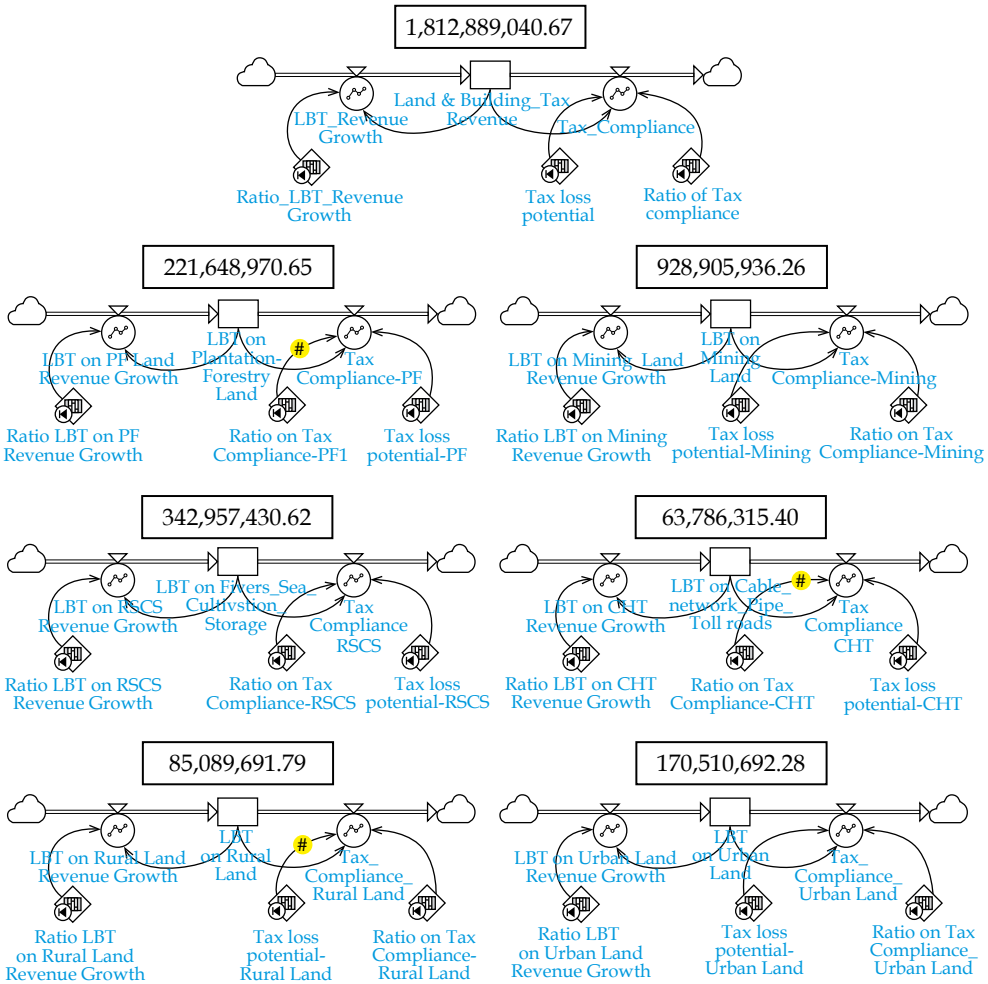

Figure 4. Pessimistic Scenario without Intervention

indicators utilized include the level of tax avoidance and tax evasion. The calculation of potential tax losses involves these two indicators, with the tax loss potential variable representing them in the simulation. It's worth noting that obtaining and disclosing data on tax avoidance and tax evasion can be challenging. Furthermore, it is suggested that imposing tax penalties on tax evasion can contribute to increasing an LBT's income (Zhang et al. [32]).

Figure 5 outlines the optimistic scenario model, capturing the dynamics of the various indicators and their interactions in the simulation.

The optimistic scenario model consists of two loops. LBT revenue serves as the Stock, loop 1 represents LBT revenue growth, and loop 2 is Tax Compliance, which includes Potential Tax Losses and Tax Compliance Ratio. The tax compliance ratio is currently set at 0.12 as the growth value, and loop 2 is considered the balancing or negative (-) loop. In this loop, the potential tax loss value is reduced by 0.50, and the tax compliance ratio is increased by 0.90. These values represent the average for Potential Tax Losses and the tax compliance ratio for various sectors, including Plantation and Forestry, Mining, River-Sea-Oil Processing, Cable-Pipe-Toll Networks, and Rural and Urban Land.

This scenario aims to validate hypothesis 2, asserting that a decrease in tax avoidance and tax evasion (represented by the potential tax loss variable) will result

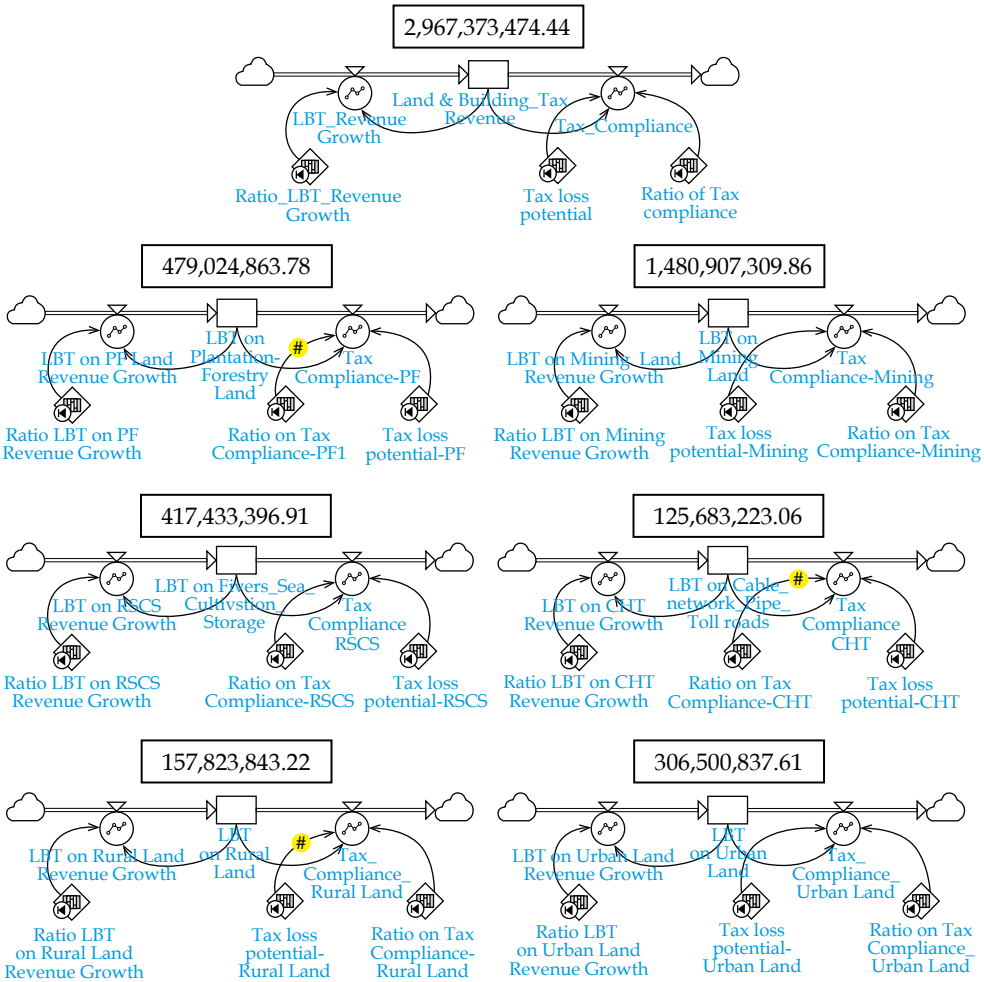

Figure 5. Optimistic Scenario with Intervention

in a significant increase in LBT income. Additionally, hypothesis 3, suggesting that an increase in tax compliance leads to a reduction in tax avoidance and tax evasion, thereby increasing LBT income as anticipated, will also be examined.

The optimistic scenario, as depicted in Figure 5, represents the condition of LBT Revenue from 2022 to 2032. The simulation was conducted with no intervention (0%).

1. Current data (2022): The average income of an LBT in the last five years is US$ 730,898,262, the number of taxpayers is 69,573,930, the average tax compliance ratio at the national level is 70.60%, and at the Cities and Regencies amounted to 45.20%.

2. The government issued policies to increase tax compliance and reduce potential tax losses by reducing tax avoidance and tax evasion by 50% from current data.

3. This scenario records LBT Income conditions in 2022–2032. The simulation was carried out with intervention to increase and reduce tax compliance with potential tax losses by 50%.

4. The average LBT growth ratio per year is 22%, the average potential tax loss is 15% per year, and the average tax compliance ratio is 90% per year (simulated increase).

The simulation results for the next ten years indicate a noteworthy increase in LBT income. When comparing the pessimistic scenario to the optimistic scenario, a substantial difference in income emerges, showing an increase of 163.68% in 2032 (Table 3).

The conclusion drawn from the optimistic scenario suggests that a reduction in tax avoidance and tax evasion (represented by the potential tax loss variable) leads to a significant increase in LBT income. Additionally, an increase in tax compliance has a substantial effect on LBT income. If the level of compliance rises, it will contribute to an increase in LBT income.

This simulation supports the validity of Hypothesis 2, which posits that reducing tax avoidance and tax evasion will lead to increased LBT income. Furthermore, Hypothesis 3 is also confirmed through this simulation, emphasizing the substantial impact of increasing tax compliance on LBT income. The optimistic scenario validates the accuracy of Hypotheses 2 and 3.

5. Discussion

5.1. Current conditions and scenario determination

At the city and regency levels, cases of low tax compliance have been evident, particularly among plantation business actors who evade tax payments. For example, in Rokan Hulu Regency, Riau Province, the level of tax compliance was low at 48.14% due to plantation and forestry management companies neglecting LBT payments. Despite their awareness of Law Number 6 of 2014 concerning Villages and Corporate Social Responsibility Law Number 40 of 2007, the local government had issued verbal notices and posted leaflets in crowded places to call on taxpayers. However, plantation employers consistently overlooked LBT payments.

Table 3. Results of LBT Calculation Simulation Using Pessimistic and Optimistic Scenarios

No.	Tax Objects	Pessimistic Scenario	Optimistic Scenario	Increase (%)
1	Plantation and Forestry Land	221,648,970.65	479,024,863.78	0.46
2	Mining Land	928,905,936.26	1,480,907,309.86	0.63
3	Rivers Sea Cultivation Storage	342,957,430.62	417,433,396.91	0.82
4	Cable network Pipe Toll roads	63,786,315.40	125,683,223.06	0.51
5	Rural land	85,089,691.79	157,823,843.22	0.54
6	Urban land	170,510,692.28	306,500,837.61	0.56
	Total LBT Revenue	1,812,899,037.00	2,967,373,474.44	163.68
	Forecast Index Values			0.61

A similar case occurred in Brebes City, Central Java Province, where only a few employers were willing to pay LBT despite severe warnings. Verbal and written warnings were issued, and banners were displayed reading: This taxpayer has not paid the LBT. The Head of the Local Revenue Service explained that the warning to display banners indicating non-payment of taxes is an effort to control tax non-compliance.

Tax theory explains that cases of low tax compliance signify the taxpayer's inclination toward tax avoidance or evasion. The solution, as suggested by O'Hare et al. [33] involves imposing strict sanctions or even closing the non-compliant company.

A study by Carrillo et al. [34] has revealed an important yet poorly understood form of tax evasion arising from "ghost companies" – fake entities that issue fraudulent receipts, enabling their clients to claim fictitious tax deductions. This study provides a unique insight into this global phenomenon, utilizing transaction-level tax data from Ecuador. Ghost transactions are prevalent among large companies and those with high-income owners, exhibiting suspicious patterns. Other instances of tax fraud include claiming false tax deductions, classifying personal expenses as business expenses, employing fake Social Security numbers, and underreporting income. Lembut & Oktariani [35] and Kollruss [36] believe that tax abuse encompasses two concepts, including tax avoidance and tax evasion.

In the analysis of the pessimistic scenario, a non-intervention policy is implemented to assess potential tax losses and increase the tax compliance ratio. The model demonstrates an increase with a sloping average annual growth. This observation indicates that the contribution of LBT income remains unchanged, and state income is projected to reach only 1.23% by 2032. However, if intervention is implemented following an optimistic scenario, LBT income is expected to grow by 61% at the end of the simulation in 2032.

Furthermore, by developing the LBT tax system, conventional practices will begin to be abandoned. The conventional method, which only uses variables of land area, land ownership, and the number of taxpayers, still guided by the system adopted during the colonial period, must now pay attention to the variables of economic conditions, city development, and developments in land prices. These variables are always increasing and are determining factors for the future. For example, land acquisition for the construction of toll roads, dams, railway lines, new cities, and the expansion of districts and provinces has increased land prices around development areas (Vitriana [37]).

Therefore, a more effective, efficient, and fair assessment system is needed. The issue arises because the increase in land prices differs from people's ability to pay taxes in urban and rural areas, leading to an increase in taxpayers' tendency to engage in tax evasion (Gumus & Yalama [38]).

According to Hussain et al. [39] studies on drastic changes in land and taxation systems worldwide that are not commensurate with people's ability to pay taxes will result in a decrease in LBT income every year. On the other hand, geothermal, coal, oil, gas, palm oil, and other companies are suspected of committing tax evasion.

The optimistic scenario serves as the reference for this study to calculate predictions of LBT acceptance in the future. Therefore, to determine the average national LBT growth ratio variable, factors such as GDP per capita indicators, the number of taxpayers, inflation rate, land area, building area, and population are considered. This composition will yield a value for the LBT income growth ratio per tax sector (Average National and Regional LBT Growth Ratio). According to Awasthi et al. [40], caution is necessary because property tax reform has proven to be more challenging than other taxes and takes time.

In the optimistic scenario, interventions were implemented to mitigate potential tax losses and raise the tax compliance ratio to 50%. By the end of the simulation in 2032, LBT income increased by 61% compared to the scenario where no government policies were implemented. Table 3 below illustrates the comparison.

This paper discussion emphasizes that there will be strong government efforts to increase tax revenues by increasing tax compliance (Postali [41]). Tax effort is calculated by comparing LGR with GRDP (Stoilova [42]). GRDP at current prices is used to determine the capacity of economic resources, shifts, and economic structure of a region, as well as the added value of goods and services, which is calculated using applicable prices in the current period. Taxation efforts can be calculated by finding the elasticity coefficient of LGR to GRDP by calculating the average growth during the 2018–2022 national budget.

These calculations show that the LBT tax ratio at the local level is still at 1.2% and 1.8% at the national level. In order to increase the amount of LBT income, many factors must be undertaken. For example, the convenience of the administration system by embracing government banks to provide good tax payment services to villages and improve tax services at the head office.

In the context of tax economics, Peacock & Wiseman [43] conducted a survey of literature on government spending growth, offering suggestions for possible future developments. They argue that the growth of public spending must be explained by utility-maximizing behavior influenced by political and economic factors. Some governments relying on tax growth to cover spending face significant risks.

Gounder et al. [44] supports the Fijian government's position that heavy spending on taxes may negatively impact investment levels and skilled human resources, potentially leading to future tax increases.

However, it is essential to remain vigilant as, in the case of Indonesia, at least four issues must be addressed to increase LBT income, each with its own correlation.

1. Increase the role of Notaries Public in preventing tax evasion. Gaps in tax losses may occur in land sale and purchase transactions when taxpayers process legal certificates with a notary public. Typically, taxpayers engage in transactions through land brokers or privately, obtaining a blank purchase receipt as proof. The land seller provides a receipt without specifying the price or land area, only a signature and duty stamp. When buyers submit legal certificates to a notary public, they tend to lower the selling price of land and buildings. Reducing the selling value decreases the amount of tax payable. These cases occur at both national and local levels, where determining the market price is challenging, making it difficult to establish the selling value of the tax object. These cases involve hidden transactions, happening frequently and proving challenging to disclose. The role of a notary public is crucial in understanding the concept of land comparison, where the value of the land is compared with the equivalent value of land in other areas based on land classification.

2. Tax avoidance in residential clusters. Cases of LBT tax arrears frequently occur in housing clusters, and this issue has been prevalent over the last five years. In luxury housing in Bekasi city alone, 13,996 taxpayers have been in arrears in LBT payments since 2018. This example is illustrative of many other housing estates in every city and regency that continue to evade tax payments. Similar cases are found in research conducted by Bimonte & Stabile [45], which also explores the negative impact of property taxes on housing supply and demand.

3. Tax evasion and avoidance by Companies. Several cases indicate that corporations attempt to evade taxes and only settle them after undergoing a tax audit or receiving a Letter of Tax Underpayment Assessment. They often wait and lobby tax officers to obtain tax relief. Instances include coal companies in Kalimantan embezzling LBT, and approximately 65% of oil palm plantations operating illegally without usufructuary rights in Sumatra. In such cases, state losses amount to US$ 313.42 billion annually (Choiruzzad et al. [46]). Corporate taxpayers' unethical behavior falls under the category of tax evasion (Lin et al. [47]). For instance, a large company in Tangerang Regency fell behind in tax payments, prompting the Corruption Eradication Commission to intervene to compel them to fulfill their

tax obligations. In Semarang, Central Java Province, the government issued a tax warning letter to a company, which went ignored. Eventually, in collaboration with the Prosecutor's Office, the local government compelled the company to settle LBT arrears totaling US$ 35 billion.

4. Tax Corruption. In a study conducted in Zimbabwe, Kurauone et al. [12] attempted to distinguish tax avoidance from tax corruption. Tax corruption is linked to politics, while tax avoidance pertains to corruption originating from taxpayers or large companies. However, this concept requires clarification as there are numerous instances where tax evasion occurs due to collusion between officials, companies, and political parties. Bani-Mustafa et al. [48], used institutional theory to investigate the impact of government efficiency on tax avoidance, considering the mediating role of ethics and the control of corruption through digitalization. (Yamen et al. [49]) revealed that most banks currently only comply with the formal aspects of financial inclusion regulations and turn a blind eye to corrupt investment money. This seems to be of little practical use in developing countries due to the influential role of capitalists in shaping state policy and corrupting certain aspects of that policy to generate profits two to three times more than the State Revenue and Expenditure Budget. This phenomenon, once observed in the United States, is now increasing in developing countries (Tarzi [50]).

However, in cases in Indonesia, aside from tax corruption by companies, it is also carried out by officials on a small scale. There are numerous cases, and what happens seems to point to weaknesses in the administrative system that need clarification.

Therefore, the government needs to enforce the law and is demanded to be more active in tax collection innovation. According to Lewis [51], this tax collection innovation must reduce the level of corruption and clientelism. Moreover, criticism is warranted as, so far, the tax authorities have not been proactive in increasing LBT income. This can be observed from the suboptimal number of audits conducted by the Directorate General of Tax Data on licensing for palm oil plantations, forestry, mining, company business development reports, and land maps, which still require improvement (Faxon et al. [52]).

Additionally, the complexity of the LBT administration system for plantations, forestry, and mining, along with weak information systems, contributes to decreased taxpayer compliance. The Directorate General of Tax and Local Revenue Agencies must be more active in sending Tax Object Notification Letters at the beginning of the calendar year to plantation license holders who are registered and unregistered as taxpayers. Furthermore, optimizing LBT income should be encouraged to be included in local planning agendas and targets to increase original local income.

6. Conclusion

The final results of the dynamic system simulation, predicting LBT income until 2032 (10 years), assume an average growth rate of 12% per annum and simulate without policy intervention to increase tax compliance and reduce potential tax losses (tax evasion and tax avoidance). The pessimistic scenario shows a minimum income tendency for state income.

This simulation supports the first hypothesis, indicating high tax evasion per tax object, averaging 14%, particularly at Plantation and Forestry objects. Meanwhile, Rivers, Sea, Cultivation, Storage, and Mining Land demonstrate that the second hypothesis has been proven.

In an optimistic scenario, if the Government intervenes with policies by increasing tax compliance and reducing potential tax loss by 50%, the contribution of each object changes, leading to an ideal, high-, and varied-income trend. The results show the maximum income change occurring in LBT with the objects of Rivers, Sea, Cultivation, Storage (0.82), Mining Land (0.63), Urban land (0.56), and Plantation and Forestry (0.46). Thus, the third hypothesis is proven: increasing tax compliance and reducing tax evasion significantly influences increasing LBT revenues.

Various problems need clarification by the central and regional governments to increase LBT income. This involves remapping, controlling, and calculating the amount of tax paid by taxpayers. Minimizing control over illegal palm oil, mining, and forestry companies, which have the potential to cause tax losses, is crucial. Therefore, the government needs to reform land maps by including legal clauses that determine complete cadastral boundaries. Imposing heavy sanctions on corrupt tax officials is necessary. Regional governments should carry out cross-sectoral coordination to control taxpayers committing tax evasion, reduce tax corruption, increase taxpayer compliance, intensify tax socialization, and establish a tax police.

Contributions to tax theory and its implications in Indonesia, which still uses conventional variables (tax bargaining) in handling tax avoidance and tax evasion, are kept to a minimum. In addition to minimizing tax avoidance and tax evasion, this research recommends using the national LBT growth ratio variable, measured by indicators such as GDP per capita, number of taxpayers, inflation rate, land area, building area, and population, to increase LBT income.

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