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Analysis of Benefit Cost Ratio of the Indonesia Low Cost Green Car Program

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***Abstract*— The Low Cost Green Car (LCGC) Indonesia Program was rolled out to develop the national automotive industry by providing incentive facilities in the form of Sales Tax on Luxury Goods for motor vehicles produced by participating companies in 2013. On one hand, this program will result in the country losing revenue from taxes Sales of Luxury Goods for vehicles produced by program participants. But on the other hand, the state also receives income from various tax-related programs, such as value-added tax, income tax, and other taxes. The purpose of this study is to calculate the cost-benefit ratio of the LCGC program using a dynamic system simulation approach. In this study, the cost component is calculated from the number of Sales Tax incentives on Luxury Goods provided by the Government in relation to the number of LCGC cars sold, while the benefit component is derived from the amount of tax received as state income from LCGC car sales. Simulation results show that the cost-benefit ratio (BCR) during the 2013-2020 simulation period shows that an average of 2.4.**

Keywords*— *Low Cost Green Car; Automotive Industry; Sales Tax on Luxury Goods; Cost Benefit Ratio; System Dynamics Simulation.

I. INTRODUCTION

The Low Cost Green Car Program initiated by the Government in 2013 is inseparable from the Government's desire to be able to develop the national automotive industry, specifically increasing the capability and independence of the industrial sector by deepening manufacturing[1]. The emergence of this program is also related to an effort by the government to be able to pursue the national motor vehicle (car) production target of 1 million units per year by the end of 2013, referring to the motor vehicle industry cluster road map [2]. In the long run, the national automotive industry will be able to become the basis for the production of 4-wheeled motor vehicles and automotive components at regional and global levels.

Speaking of the development of the automotive industry in Indonesia, this industrial sector has actually been developed since the 1930s. In the course of this Indonesian automotive industry experienced ups and downs[3][4][5]. Until finally in 2009, the Government of the Republic of Indonesia through the Ministry of Industry had compiled a map of the motor vehicle industry cluster[2]. In [2] it is stated that the future development of the national automotive industry will be directed towards the development of two-wheeled or four-wheeled or more and motorized vehicle components with an emphasis on environmentally friendly and energy-efficient vehicles. The development of this program is also in line with [6][7][8] which states that to enter the automotive market in both developed and developing countries until 2020, there are seven trends that must be considered by the world's motor vehicle manufacturers that will affect the market, one of which is related to the sustainability life and is also associated with low costs.

In this LCGC car program, the Government of Indonesia provides facilities in the form of Sales Tax on Luxury Goods for motor vehicle manufacturers both local and international brand car manufacturers that are participants of the program [9]. In return, program participants must have a commitment to invest investment in the automotive industry and in the new automotive component industry in the country [1].

Since its inception, this affordable and energy-efficient car program has generated pros and cons in the community, especially because the Government provides Sales Tax on Luxury Goods incentives for affordable and energy-efficient vehicles for program participating companies [10]. For people who agree, the existence of this program makes the community as consumers have the opportunity to have a car at a cheaper price because the Sales Tax on Luxury Goods is released by 10%. But people still have to pay other taxes such as Value Added Tax (VAT) and Motorized Vehicle Tax in the regions. For people who are contra, the existence of this program can have side effects, such as traffic jams. In addition, this program policy is considered potentially detrimental to state finances due to reduced state revenue due to Sales Tax on Luxury Goods facilities provided by the Government for affordable and energy-efficient cars.

Since it was rolled out in 2013 until 2019, this program has been followed by four car manufacturing companies, namely: PT. Astra Daihatsu Motor, PT.

Honda Prospect Motor, PT. Suzuki Indomobil Motor, and PT. Nissan Motor Indonesia. Total production and total sales of LCGC cars were 1,142,481 units respectively, and 1,136,795 units were sold [8]. To find out the effectiveness of the Sales Tax on Luxury Goods facility for the LCGC program from the time, it was rolled out from 2013 to 2018, an analysis of the cost benefits of the LCGC program used a dynamic system simulation. In this study only focused on calculating the value of the benefit-cost ratio of the LCGC program that has been rolled out. This ratio is an indicator used in a cost-benefit analysis, which seeks to summarize the overall monetary value of a project. In calculating the benefit-cost ratio of this program, the benefit aspect is in the form of the estimated value of taxes received by the Government, and the cost aspect is in the form of estimated Sales Tax on Luxury Goods value issued by the Government for this program. The simulation period is carried out from 2012 to 2020. The use of dynamic system simulation methods is because this method is able to answer both complex problems and issues and has policy implications, and the modeling process using this method departs from a simple model and can more quickly develop and the causal relationships of the variables in the model are more easily communicated to non-technical communities.

II. METHODOLOGY

This study presents the simulation results of the calculation of the costs-benefits ratio of the Low Cost Green Car program from 2012 to 2020 using a system dynamics methodology.

The benefit-cost ratio is an indicator used in a cost-benefit analysis, which seeks to summarize the overall monetary value of a project or proposal [11]. Cost-benefit ratio, quantitatively calculated by dividing all benefits obtained from a program (in accordance with the agreed size limits) with all costs or sacrifices incurred during the activity carried out, where both (benefits and costs) are calculated with the same units, for example in rupiah or production units. The higher the value of the cost-benefit ratio, the better the investment/program. The general rule is that if the benefits are higher than the project cost is a good investment.

The system dynamics modeling process simulation in this study consists of five stages, referring to the proposed modeling stages [12] and [13], namely: problem definition, system conceptualization, dynamic model making, model testing, and policy design and model evaluation. Using a system dynamics modeling approach, the cost-benefit ratio of the LCGC program is as follows.

The first stage of this research is defining the problem. Defining the problem is the most important stage in modeling dynamic systems. At this stage the research questions are raised, key variables, graphs of behavior patterns represented by the behavior of system variables relating to the problem are identified.

Various related literatures are studied. The problem that will be raised in this study is the value of the cost-benefit ratio of the LCGC program. In determining the benefits, cost and cost-benefit ratio calculation of the LCGC program the following assumptions are used referring to Fig. 1. From Fig. 1 it can be seen that:

a. The benefits component is state revenue in the form of tax revenues received by the Government from the sale of LCGC vehicles. The taxes received by the Government related to the LCGC program are VAT from Vehicle Manufacturing Companies and Dealers, Personal Income Tax from Manufacturing Companies and Dealers, Corporate Income Tax Vehicle Manufacturing Companies and Dealers, Other Taxes.
b. The Cost component is the Government's opportunity loss for Sales Tax on Luxury Goods that is released on LCGC vehicles, Sales Tax on Luxury Goods. Referring to [6], the Sales Tax on Luxury Goods value for this type of vehicle is 10%.

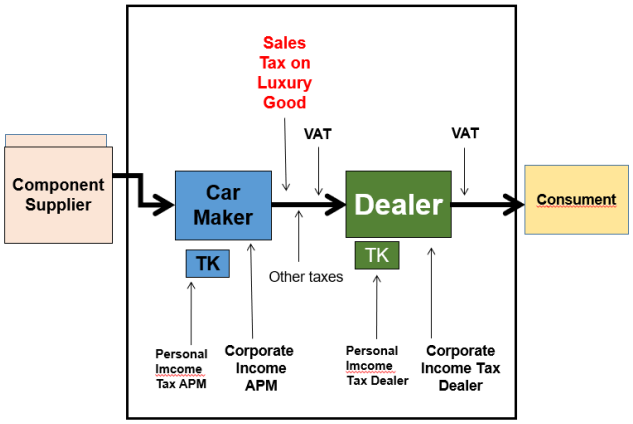

Fig. 1. *Variable Concept Model for Calculation of Benefit-Cost Ratio of LCGC Program*

Thus, the questions in this study are specifically focused on three questions: 1) what is the value of Sales Tax on Luxury Goods incentives that must be given by the Government for this LCGC program, 2) what is the state revenue from taxes related to the LCGC program and 3) what is the ratio the benefits and costs of the LCGC program from 2012 to 2020.

At this stage, various literature related to the national automotive sector is examined to get a clear articulation of research problems. Various preliminary information and related data, such as car production and sales, both LCGC and non-LCGC cars, taxation data such as VAT, Sales Tax on Luxury Goods, Income tax, policy data on automotive and LCGC programs are needed at this stage. Then the key

variables are identified, dynamic reference behavior patterns and time horizons of the key variables.

TABLE 1. LCGC PRODUCTION AND SALES

Year	Production (unit)	Sales (unit)
2012	-	-
2013	54.982	53.078
2014	172.736	170.986
2015	162.926	163.425
2016	237.337	233.494
2017	231.789	235.292
2018	229.185	227.959

Source: processed form [14]

The key variables in this study are the number of Production and Sales of LCGC cars, the value of Sales Tax on Luxury Goods, and the value of State Revenue, and the benefit-cost ratio (BCR) program. In addition to the key variables, various parameters and other variables are identified to complete the dynamic system model. Table 1 shows the LCGC car sales data from 2012 to 2018.

The second stage is the stage of Conceptualization of the System. The conceptualization stage of the system is the stage for constructing a hypothesis, a working theory that explains the causes behind dynamic problems. At this stage, important variables other than the key variables at the previous stage which are very influential are depicted in the form of causal loop diagrams. In this study, the dynamic hypothesis that will be proposed is 1) The amount of LCGC car sales affects the amount of Sales Tax on Luxury Goods that must be paid by the Government 2) The number of LCGC car sales affects the State Revenue in the form of taxes paid by companies.

The third stage is the stage of making dynamic models. This stage is the stage of the process of making a formal model complete with various mathematical formulations that explain the causal relationship of all variables, estimating numerical parameter values and initial stock values that represent the system and testing the consistency of the model internally against dynamic hypotheses. This process also involves the use of computer software packages. In this study Powersim Studio 10 Professional is used. At this stage, a stock model and flow model of the cost benefit calculation LCGC program was built. Fig. 1 and Fig. 2 each show a stock and flow diagram for the LCGC production and sales sub-system and the LCGC BCR sub-system.

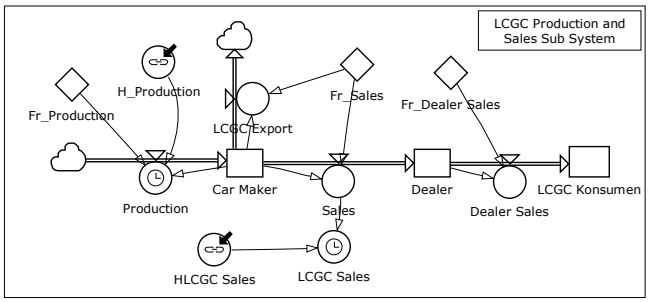

Fig. 2.*LCGC Production and Sales Sub System*

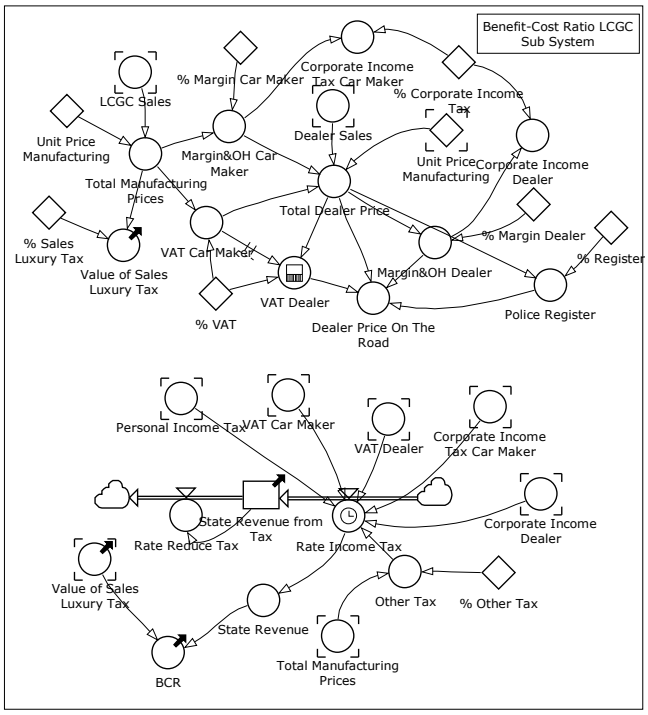

Fig. 3.*Benefit-Cost Ratio LCGC Sub System*

Test and validation of the models are done to see whether the model built is sufficient to represent a real problem by referring to the objectives of this study by looking at two aspects, namely: structural and behavior of the resulting model. Structural validation involves testing the relationship between variables, including unit validation of unit equation models. Whereas the behavioral test involves testing the pattern of the model's behavior compared to its historical data.

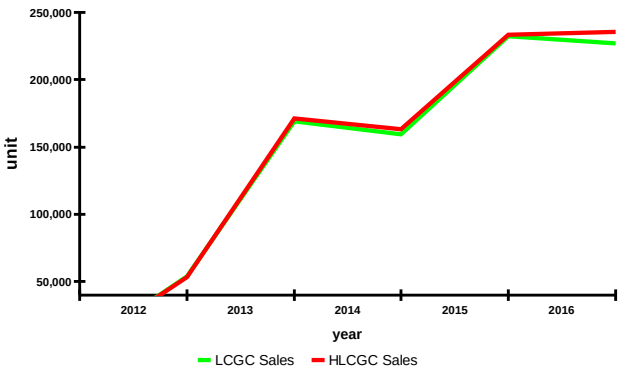

Fig. 4.*Behaviour Test: LCGC Sales*

Policy design and evaluation to test new policy choices to see how likely the model can improve the dynamics of the model.

III. RESULTS AND DISCUSSION

The estimated results of LCGC sales, the amount of sales tax on luxury goods that must be paid by the Government for LCGC program vehicles, and the amount of state revenue from taxes related to the LCGC program using dynamic system modeling from 2013 to 2020 can be seen in table 2. While the results of the simulation value sales tax on luxury goods and Government revenue from the LCGC program in graphical form from 2012 to 2020 can be seen in fig. 5.

The amount of sales tax on luxury goods is the cost that must be paid by the Government for this LCGC program, while the amount of state revenue derived from taxes related to the sale of LCGC is a benefit of the program. From table 2 it can be seen that the amount of LCGC product sales during the simulation period from 2013 to 2020 respectively were 53,609 units, 172,696 units, 165,059 units, 235,829 units, 237,645 units, 230,239 units, 234,708 units, and 245,307 units. This number from 2013 to 2020 continues to increase.

In this simulation, it is assumed that in 2013, the price of 1 unit of LCGC vehicles coming out of a vehicle manufacturer is an average of IDR 80,000,000.00. The value of this assumption was taken because the LCGC vehicles produced by the program participants consisted of several models and types with prices varying from a price of IDR 60,000,000.00 to a price of IDR 95,000,000.00, so as to facilitate the calculation of simulation the price assumptions were taken. of that value. Furthermore, the total sales price of LCGC per year can be calculated by multiplying the price of 1 unit of LCGC vehicle by the number of sales of the LCGC vehicle per year. If the sales tax on luxury goods percentage is 10%, then the value of this sales tax on luxury goods multiplied by the total sales price of LCGC will obtain the sales tax on luxury goods value of all LCGC sales per year. In table 2, the sales tax on luxury goods column shows the value of sales tax on luxury goods that must be paid by the Government annually from 2013 to 2020. From table 2 the amount of sales tax on luxury goods during the simulation period from 2013 to 2020 respectively was IDR 428,870,240,000, IDR 1,381,566,880. 000, IDR 1,320,474,000,000, IDR 1,886,631,520,000, IDR 1,901,159,360,000, IDR 1,841,908,720,000, IDR 1,877,666,868,000, and IDR 1,962,161,877,060. The amount of sales tax on luxury goods that must be paid by the Government continues to increase. It is estimated that the sales tax on luxury goods accumulation that must be paid in 2020 is IDR 12,600,439,465,060.

The estimated results of the amount of state revenue from the LCGC program categorized as the benefits of the LCGC program can be seen in table 2. From table 2 it can be seen that based on the results of the simulation conducted, the amount of state revenue during the simulation period from 2013 to 2020 respectively were IDR 1,016,422,468,800, IDR 3,342,480,310,720, IDR 3,171,012,802,781, IDR 4,501,474,698,637,IDR 4,556,131,914,879, IDR 4,362,153,806,243, IDR 4,489,749,483,604, IDR 4,739,237,524,202. If all state revenues from the LCGC program are accumulated from 2013 to 2020, then a value of IDR 30,178,663,009,866 will be obtained.

From table 2 it can be seen that state revenue is greater than the sales tax on luxury goods or the benefits obtained are still greater than the costs incurred for the LCGC program. The amount of the Benefit-Cost ratio of the LCGC program during the simulation period from 2013 to 2020 ranged from 2.37 to 2.42. Thus it can be said that the LCGC program is a profitable program.

TABLE 2. LCGC SALES, SALES TAX ON LUXURY GOODS, AND GOVERNMENT REVENUE FROM SIMULATION RESULTS FROM 2013 TO 2020

Year	Sales (unit)	Sales Tax on Luxury Goods (IDR)	State Revenue (IDR)	BCR
2012	0	0	0	0,00
2013	53.609	428.870.240.000	1.016.422.468.800	2,37
2014	172.696	1.381.566.880.000	3.342.480.310.720	2,42
2015	165.059	1.320.474.000.000	3.171.012.802.781	2,40
2016	235.829	1.886.631.520.000	4.501.474.698.637	2,39
2017	237.645	1.901.159.360.000	4.556.131.914.879	2,40
2018	230.239	1.841.908.720.000	4.362.153.806.243	2,37
2019	234.708	1.877.666.868.000	4.489.749.483.604	2,39
2020	245.307	1.962.161.877.060	4.739.237.524.202	2,42

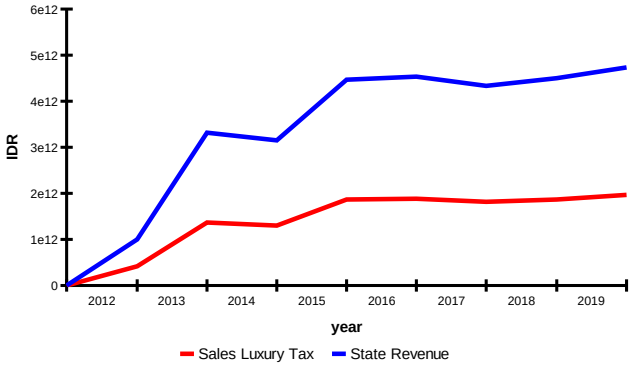

Fig. 5.*Sales Tax on Luxury Goods and State Revenue Simulation Result*

In conducting the simulation of the calculation of the cost benefit ratio of this program, the components of benefits and costs included in the calculation are all components that are already in the form of the same unit (currency) of rupiah, so that it is easier to get the data and process the calculation. Other benefit components that can be identified such as the economic effects of the community that arise, the

deepening of the national automotive manufacturing industry, the growth of the new component industry due to the LCGC program or for other cost components such as pollution effects or congestion due to additional LCGC vehicles are not included in the research this is because these components must be studied in more depth to determine the formula and the amount in the form of units of rupiah (IDR).

IV. CONCLUSIONS

This paper presents the results of the analysis of the calculation of the cost benefit ratio of the LCGC program. The LCGC program is one of Indonesia's automotive industry development programs, developed in 2013.

The calculation of the cost benefit ratio of the LCGC program uses a system dynamics simulation approach. The simulation results show that the value of the benefits of the LCGC program, expressed by the State Revenue from taxes due to the program, is greater than the cost stated by the value of sales taxes on luxury goods. The result of simulation shows that the accumulation of state revenues from the LCGC program from 2013 to 2020 is IDR 30,178,663,009,866 and the sales tax on luxury goods accumulation from 2013 to 2020 is IDR 12,600,439,465,060. The average value of the cost benefit ratio of the LCGC program resulting from the simulation is 2.4.

Going forward, this research is expected to take into account and add other components both in terms of benefits and in terms of costs to complete the analysis and calculation of the benefit cost ratio of the LCGC program.

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REFERENCES

[1] Kementerian Perindustrian Republik Indonesia, *Peraturan Menteri Perindustrian Republik Indonesia Nomor 33/M-IND/PER/7/2013 tentang Pengembangan Produksi Kendaraan Bermotor Roda Empat yang Hemat Energi dan Harga Terjangkau*.

[2] Kementerian Perindustrian Republik Indonesia, *Peraturan Menteri Perindustrian Republik Indonesia no. 123/M-IND/PER/10/2019 tentang Peta Panduan Pengembangan Klaster Industri Kendaraan Bermotor*. .

[3] W. P. Tai, "The Political Economy of the Automobile Industry in ASEAN: A Cross-Country Comparison," *JAS (Journal ASEAN Stud.*, vol. 4, no. 1, p. 34, 2016.

[4] I. Ismanto, "Kebijakan industri otomotif Indonesia," *Verity*, vol. 2, no. 4, p. 29, 2010.

[5] M. P. Soejachmoen, "Globalization of the Automotive Industry: Is Indonesia Missing Out?," *Asian Econ. Pap.*, vol. 15, no. 1, pp. 1–19, 2016.

[6] Deloitte, "A-new-era: Accelerating toward 2020-An automotive industry transformed," 2009. [Online]. Available: https://www2.deloitte.com/content/dam/Deloitte/in/Documents/manufacturing/a-new-era-auto-transformation-report-online.pdf. [Accessed: 12-Jul-2017].

[7] A. Koster, F. Kuhnert, and C. Stürmer, "Five trends transforming the Automotive Industry," 2018.

[8] M. Scherer, D. Cassidy, T. Utomo, and B. Karnadi, "Opportunities and Challenges in Indonesia's Automotive Industry," 2016.

[9] Pemerintah Republik Indonesia, *Peraturan Pemerintah Republik Indonesia no. 41 Tahun 2013 jo no. 22 Tahun 2014 Tentang Barang Kena Pajak Yang Tergolong Mewah Berupa Kendaraan Bermotor Yang Dikenai Pajak Penjualan Barang Mewah*. .

[10] H. Klise, "Insentif PPnBM terhadap Low Cost Green Car," *InsideTax*, pp. 22–29.

[11] "https://www.wallstreetmojo.com/benefit-cost-ratio/."

[12] J. D. Sterman, *Business Dynamic: Systems Thinking and Modelling for a Complex World*. New York: Irwin McGraw-Hill, 2000.

[13] B. Y, "System Dynamics: Systemic Feedback Modeling for Policy Analysis," *Encyclopedia of Life Support Systems*. 2002.

[14] "https://www.gaikindo.or.id."