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COST BENEFIT ANALYSIS AND DETERMINATION OF LIQUID WASTE TAX RATES COMMERCIAL BUILDINGS IN DKI JAKARTA

Maria Ariesta Utha
Faculty of Economics and Business, Universitas Trisakti, Indonesia
Email: maria.utha@trisakti.ac.id

KEYWORDS
liquid waste concentration; extended cost benefit; marginal abatement cost; marginal damage cost; pigovian tax

ABSTRACT
This study aims to analyze the cost benefits of wastewater treatment and the determination of liquid waste tax rates on commercial buildings in the DKI Jakarta area. The variables used are (i) positive externalities that are proxied through labor and the benefits of wastewater treatment, (ii) concentration of liquid waste which includes Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Organic (KMnO4), and Total Suspended Solid (TSS), (iii) Liquid waste processing costs, (iv) Costs incurred by the community due to pollution. This research was conducted used an explanatory research approach and descriptive research. The samples used were commercial buildings X, Y and Z and communit affected liquid waste in central Jakarta. The analytical method used is Extended Cost and Benefit Analysis, Marginal Abatement Cost (MAC), Marginal Damage Cost (MDC) and Pigovian Tax. For marginal damage costs used economic valuation and determining the optimum tax rate used the Pigovian Tax approach. The results show that buildings that have Liquid Waste Treatment Plants produce positive externalities, namely employment and the reuse of liquid waste processing results in the form of gardening, car wash, cooling tower, and reverse osmosis. In addition, commercial buildings that carry out liquid waste treatment have economic feasibility due to cost efficiency and are also environmentally feasible with the allocation of liquid waste treatment costs.

INTRODUCTION

Water pollution is one of the main issues for the decline in environmental quality in Indonesia. One of the islands with a high level of water pollution is the DKI Jakarta area. The monitoring results of the Ministry of Environment from 2018 to 2019 show that the average concentrations of BOD and COD in the Ciliwung, Citarum and Cisadane rivers show improvement from 2018 to 2019, but haven't improved water quality to meet class II water quality. These improvements were partly due to the addition of Domestic WWTP infrastructure development (IKLH, 2019).

The Government of DKI Jakarta in the context of managing liquid waste pollution has issued several regulations related to building construction and management of liquid waste pollution as stipulated in the Regulation of the Governor of DKI Jakarta Province Number 122 of 2005 concerning Management of Domestic Wastewater in DKI Jakarta Province that buildings are required to install Liquid Waste Treatment.

Wastewater recycling has received serious attention from industry in Indonesia because it is related to clean water crisis issues and health quality (Crini & Lichtfouse, 2019). However, research by Ratnaningsih (1996) shows that several companies do not build WWTPs because the installation of waste treatment plants requires very high costs, so companies prefer to reduce production levels or continue production at the same level by paying waste fees. The

Government of DKI Jakarta in order to reduce the level of contamination of liquid waste, issued a regulation relating to the quality standard of liquid waste. This regulation consists of two, namely the Decree of the Governor of DKI Jakarta No. 1040 of 1997 concerning Quality of Sewerage System in the Special Capital City Region of Jakarta and Regulation of the Governor of DKI Jakarta Province Number 122 of 2005 concerning Quality Standards of Liquid Waste.

The responsibility of the private sector at this time in reducing the negative impact of water pollution begins to be seen with the implementation of the green building concept because it contains principles related to material recycling and reuse as well as water conservation and water quality (http://gb cindonesia.org, 2016). The DKI Jakarta Government in supporting the implementation of Green Building is outlined in Governor Regulation (Pergub) Number 38 of 2012 which requires buildings to apply the green building concept. The number of buildings certified green by GBCI is still limited to only 20 buildings in 2018 (Widiarsa et al., 2021). This is due to higher costs and limited knowledge about sustainable practices. The cost of green buildings in the country is between 10%-15% higher than conventional buildings (Berawi et al., 2019; Waters, 2014). One of the benefits of implementing green building is the obligation to process liquid waste at the building site and be able to reuse the results of liquid waste processing.

Studies that lead to the formulation of policies related to incentives or regulations to protect the environment and control pollution are still limited. According to some views, in responding to the impact of externalities, one of them can use a cost benefit approach (Chakraborty et al., 2001; O'Mahony, 2021; UNRISD, 1994). Analysis of the cost benefit ratio (cost benefit ratio) is a conventional calculation technique, because it is considered not to include elements of externalities. So that some economists have developed an Extended Cost Benefit Analysis (ECBA) which includes direct economic costs, social costs and environmental resources (Dixon & Hufschmidt, 1986; O'Mahony, 2021; Pomeroy, 1992; Suparmoko, 2002). In addition to sustainability practices carried out by the private sector in the form of cost allocation for reducing pollution, government intervention is also needed in formulating policies through fiscal instruments through taxes whose calculations also include elements of social costs borne by the surrounding community. This type of tax is called an environmental tax known as the "Pigovian Tax" (Edenhofer et al., 2021; Khanna, 2003; Yan et al., 2021) as a form of implementing the polluters pay principle (Suparmoko & Ratnaningsih, 2012). Determination of liquid waste tax collection used the Pigovian tax can use the Marginal Abatement Cost (MAC) equilibrium approach which is a measure of the allocation of costs for reducing pollution and Marginal Damage Cost (MDC) which is a measure of social costs (Edenhofer et al., 2021; Masur & Posner, 2015). Moreover, the study aims to analyze the cost benefits of wastewater treatment and the determination of liquid waste tax rates on commercial buildings in the DKI Jakarta area.

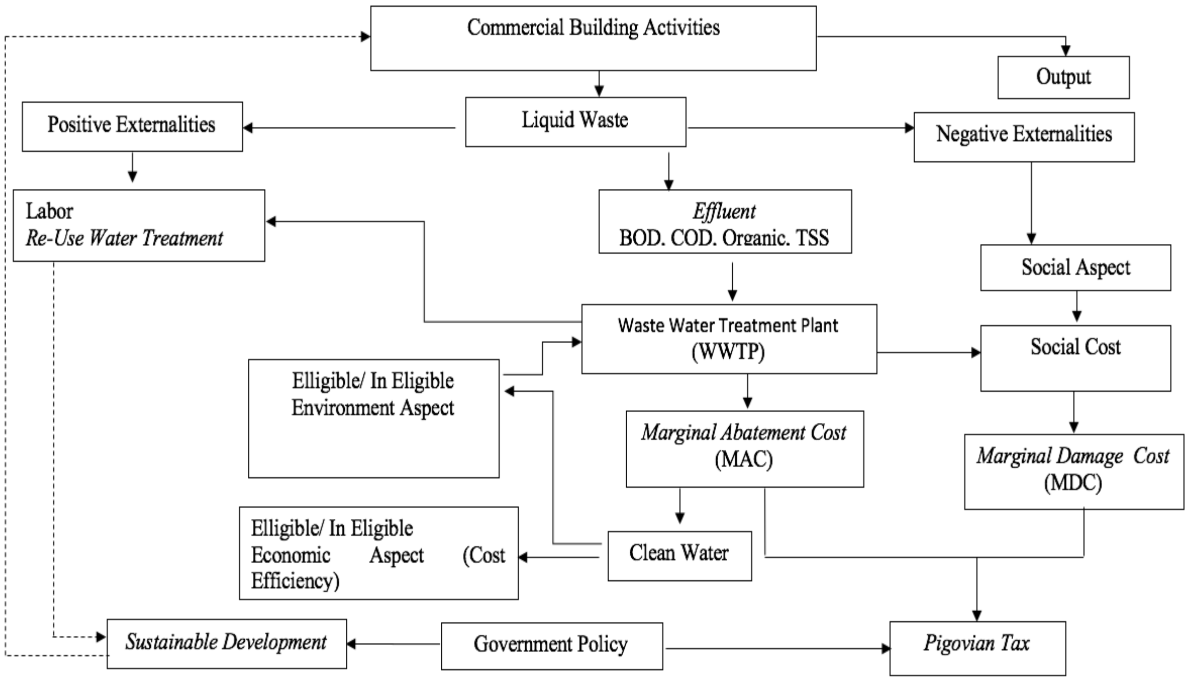

Figure 1. Conseptual Framework

RESEARCH METHOD

This study aims to analyze the cost benefits and determine the tax levy on liquid waste in creating sustainable development. The object of this research is a company that has SIUP Pemda DKI Jakarta. The observation period of this study is from the 2018-2019 period. The object of this research consists of 2 buildings with green building certification and 1 building that does not yet have green building certification. While the people who were sampled were 30 residents who live in Kebun Kacang Village, Central Jakarta, with 30 respondents being residents affected by the liquid waste. These three companies are used in order to compare the benefits and costs as a result of the presence or absence of a Wastewater Treatment Plant (WTP) in the three buildings.

The sampling technique in this study used a non-probability sampling approach with a purposive sampling method. Primary data were obtained from field observations and interviews with building management. The variables used in this study are as follows:

1) Positive Externalities Measured based on direct benefits, namely the reuse of remaining process water (re-use) and indirectly in the form of absorption of the number of workers and wages
2) Negative externality is the presence of liquid waste which causes contamination that affects the health conditions of the surrounding community. The indicator is the high level of inlet-outlet contamination that flows into the river body that passes through residential areas, which will affect the quality of drinking water and public health.
3) Costs consist of liquid waste treatment costs and WWTP maintenance costs (Kraemer, Kampa & Interwies, 2004; Hamid & Razif, 2014).
4) The benefits measured are direct benefits, namely cost-saving efficiency for the company, namely the difference between the cost of used PDAM water and the cost of re-use water.
5) Quality standard of BOD, COD, organic and suspended solids (TSS) wastewater. The concentration of waste in each parameter uses the average inlet and outlet samples.

6) The Benefit Cost ratio that has been developed (Pillet, et.al, 2005), which is the sum of all direct benefits and environmental benefits, is then divided by the costs incurred for wastewater treatment.
7) Marginal abatement cost (MAC) is an additional cost incurred by companies in industrial sector wastewater processes to reduce unit units (mg/l) of concentration of waste pollutant parameters in a certain period.
8) Marginal Damage Cost (MDC): additional damage costs due to additional units (mg/l) of liquid waste concentration parameters.
9) The actual market price in this study is related to aspects of human health due to pollution, so the approach uses the cost of illness.
10) Forgone earnings are the economic value of people's income that is reduced or lost as a result of environmental pollution and/or damage.
11) Liquid waste tax uses the Pigovian tax approach.

The data analysis method used is the Extended Cost and Benefit Ratio (ECBA) and the Pigovian Tax approach obtained from the equilibrium of Marginal Abatement Cost (MAC) and Marginal damage cost (MDC).

RESULT AND DISCUSSION

Result

Positive Externalities and Negative Externalities

The impact of the activities of commercial buildings consists of positive and negative impacts. The resulting positive impact is the absorption of labor for the field of liquid waste management in buildings X, Y and Z. In addition to the positive benefits in the form of employment, the WWTP has a positive impact on companies to reduce company costs in buildings that apply the green building concept, namely X and Y building. Commercial building activities besides having a positive impact also have a negative impact which is important to study, namely the presence of liquid waste that affects the environment and social community. The increase in the amount of liquid waste in commercial buildings when viewed from its development is very fluctuating. The amount of waste generated depends on the water usage capacity of the building users. Liquid waste that has the highest effluent concentration value is COD followed by Organic, BOD and TSS. This is evidenced by the inlet value which exceeds the domestic wastewater quality standards set by the government.

Extended Cost Benefit Analysis

The determination of economic and environmental feasibility uses the Extended Cost Benefit Ratio (ECBR) approach which has been developed by including environmental costs, namely the cost of wastewater treatment in the calculation. Benefit indicators that are specifically measured use benefits received as a result of liquid waste management and cost indicators used the costs for liquid waste management. After calculating the ratio of costs and benefits of waste water management in 2018 and 2019, the ECBR figures were obtained, respectively, at 1.58 and 1.68, greater than 1, meaning that X building activities were economically and environmentally feasible. PT. X will get a higher profit if he allocates part of his income for liquid waste treatment of IDR 6,500/m^3.

Specifically, for the calculation of the ECBR for Y building, environmental costs include treatment costs of IDR 992,250,000 and WWTP machine maintenance costs of IDR. 240,000,000 in 2018 and 2019, so that the total allocation for pollution reduction costs is IDR 1,232,250,000. Each EBCR figure of 1.48 is greater than 1, meaning that Y building activities are economically and environmentally feasible. Y building will get a higher profit if it allocates part of its revenue for liquid waste treatment of IDR 5,000/m^3 or savings in the cost of purchasing PDAM water of IDR 1.825 billion.

Wastewater management costs in 2018 and 2019 for Z building show an ECBR figure of 0, less than 1, meaning that the activities of Z building, even though in terms of numbers, do not meet the standards set, but the management of Z building has carried out obligations and responsibilities towards the environment to allocate part of the profits for processing liquid waste from hospitality activities through the services of Pal Jaya Setiabudi wastewater treatment so that the concentration level of pollution is below the threshold set by the government. However, the management of Z building doesn't benefit directly from processing the liquid waste for reuse, so the management of Z building must used tap water 100% at a purchase price of IDR 12,500/m^3. The benefits that are directly felt by the management of Z building are that the company's operations continue because the management of Z building had participated to reduce the levels of contamination required by the DKI Jakarta government even though it's being carried out by a third party, namely PAL Jaya Setiabudi. With ongoing operations, other multiplier effects are employment and business income.

The quality standards for the management of liquid waste for buildings X and Y refer to the Regulation of the Governor of DKI Jakarta Province Number 122 of 2005. The highest average inlet for the period July 2014 to June 2015 at X for STP A and STP B was the COD parameter of 916,652 mg/l followed by Organic parameter was 301.53 mg/l, Suspended solids (TSS) was 282.688 mg/l, BOD was 123.005 mg/l. Likewise, the highest average Y inlet in 2015 was the COD parameter of 200 mg/l followed by the Organic parameter of 180 mg/l, TSS of 175 mg/l and BOD of 100 mg/l, exceeding the quality standards required by the government for each category. - each maximum for BOD = 50 mg/l, COD = 80 mg/l, Organic (KMnO4) = 85 mg/l and TSS = 50 mg/l.

As a form of obligation in order to follow government regulations and also as a company that pays attention to sustainability both from economic, environmental and social aspects so as to obtain Green Building certification, both X and Y buildings carry out liquid waste treatment by installing an installation located on the ground floor whose management is carried out by sub contract company. The fee used by X for the treatment of liquid waste is based on the amount of waste produced, which is 3500/m^3, while Y building used a monthly fixed fee of IDR 82,687,500/month.

The results of the liquid waste processing from the two companies were able to reduce the level of contamination to below the quality standards set by the government referring to the Regulation of the Governor of DKI Jakarta Province Number 122 of 2005. The lowest average outlet for the period July 2018 to June 2019 was the BOD parameter of 4.305 mg/l, TSS was 6.42 mg/l, Organic was 9.99 mg/l was COD was 39.93 mg/l, while Y outlet BOD was 30.2 mg/l, TSS was 38.2 mg /l, Organic 49.2 mg/l and COD 67 mg/l. This shows that liquid waste in the form of outlets from buildings Y and X is feasible to be channeled into the river body.

The amount of treated wastewater discharged into the river body by buildings X and Y with an average discharge of between 300 m^3/day to 400 m^3/day (assuming 24 hours), follows the provisions set by the government.

In contrast to buildings X and Y, the quality standard used as a reference for Z building is DKI Jakarta Governor Decree No. 1040 of 1997 concerning Quality Standards for Wastewater Pipeline Systems (Sewerage System) in the Special Capital Region of Jakarta.

The average inlet value generated for BOD is not known in detail because the procedure for identifying the quality standards of liquid waste in Z building is different from X and Y buildings. Z building does not have a liquid waste treatment plant, but an examination of the level of inlet liquid waste is carried out by Pal Jaya Setiabudi once a year. The aim is to measure the feasibility of the waste being channeled into the DKI Jakarta pipeline system that goes to the Setiabudi reservoir. Liquid waste that is suitable for entering the Setiabudi reservoir must not exceed the quality standards set, namely the maximum limit of BOD = 400 mg/l, COD = 600 mg/l, Organic (KMnO4) = 550 mg/l and TSS = 850 mg/l. The results of outlet Z are BOD of 128 mg/l, COD of 318 mg/l, organic of 159 mg/l, TSS of 147 of mg/l below the required quality standard according to DKI Jakarta Governor Decree No. 1040 of 1997.

The value of Z building outlets is considered as the inlet that enters the Setiabudi reservoir. The quality of liquid waste shows the specifications of the waste which is measured by the amount of pollutant content in the waste. The pollutant content in the waste consists of various parameters. The smaller the number and concentration of parameters indicates the smaller the chance for environmental pollution to occur.

The results of this study also show that there is an increase in the value of contamination in commercial buildings X and Y which is dominated by the COD inlet value followed by BOD and Organic parameters and the trend of polluted values is experiencing fluctuating developments.

The processing of liquid waste in Z building is carried out by Pal Jaya Setiabudi with a total annual cost of IDR. 73,926,000 or per m2 of IDR. 675.75 because the basis for calculating the levy for liquid waste in Z building is the building area. If the cost of liquid waste treatment is calculated based on the amount of liquid waste produced, the calculation will produce a different value. If it is assumed that the amount of liquid waste generated from 2014 to 2015 is equal to the amount of clean water used, then the average waste is estimated to be IDR 27,195.75 m^3/month or 894.36 m^3/day, the liquid waste treatment cost is IDR. 2,731. 75/m^3 (or IDR 73,926,000/ 27,195.75 m^3). The outlet generated by Z building is considered as an inlet that enters the Setiabudi reservoir. The inlet is processed by Pal Jaya Setiabudi referring to the liquid waste quality standard Regulation of the Governor of DKI Jakarta Province Number 122 of 2005. The results of waste treatment by Pal Jaya Setiabudi the average output output is as follows BOD 44.9 mg/l; COD 76.68 mg/l; Organic 52.67 mg/l; and TSS 46.75 mg/l. The results of liquid waste processing in the form of outlets from Pal Jaya Setiabudi deserve to be disposed of into the Pejompongan river.

Determination of liquid waste fees based on the size of the building has a weakness because the number of buildings is large if it is not supported by a high level of water used the quantity of waste and the level of contaminants produced will be small but the fees that must be paid by the company remain the same from time to time to the management. waste, this will be detrimental to the company. Vice versa, if a company with high water use activities produces a high quantity and contamination of liquid waste, but the fees for processing the waste remain / are lower than the level of contamination, then this will be detrimental to Pal Jaya or the DKI Jakarta government. Conditions like this can also occur in the liquid waste processing fee determination system implemented by the Y building management. The determination of liquid waste fees is regulated in Article 9 of the Regional Regulation of the Province of the Special Capital Region of Jakarta Number 3 of 2012 concerning Regional Levies.

The used of liquid waste treatment installations aside from being a cost for the company but on the other hand provides positive benefits for the company, namely in the form of substantial cost savings for the company. Because in addition to used PAM water, the company also reuses water from wastewater treatment. The treated water by the WWTP company was bought back by parties X and Y from the wastewater treatment plant sub-contract company at prices of IDR 6,000/m^3 and IDR 7,500/m^3. This will reduce the costs that must be incurred by the company if it uses tap water at a price of IDR 12,500 m^3. This means that the savings in the cost of used water for X is IDR. 6,500/m^3 while for Y building, it is IDR 5,000/m^3. Part of the water is reused for cooling towers, gardening, car washing and partly is processed again used the Reverse Osmosis (RO) method for daily needs in accordance with drinking water quality standards and obtaining an MUI certificate. Cost savings as a result of efficient water used costs are obtained by the building management X amounting to IDR 3,075,464,685 per year, and building management Y of IDR 1,825,000,000. The estimated results of the cost benefit ratio of wastewater treatment for buildings X and Y are in the proper category.

The estimated cost benefit ratio of Z building wastewater treatment is in the economically unfeasible category. This is because the manager of Z building does not benefit directly from wastewater treatment. The management of liquid waste in Z building is carried out by Pal Jaya Setiabudi in a different location so that the water used in Z building is 100% PAM water. However, in terms of the environmental aspect, Z building is categorized as feasible because it allocates part of its income to treat liquid waste in order to reduce the level of contaminants that enter the river body.

X and Y building's for deep wells are not activated to meet the water supply due to: (i) according to DKI Jakarta Provincial Government policy, if one area is supplied with PAM water, then groundwater is not allowed to be used, and (ii) Regulations No 37/2009 concerning the Acquisition Value of Water as the Basis for Imposing Tax on Extraction of Groundwater, with a groundwater price of IDR 102,081 per cubic meter compared to the price of PAM water of IDR 12,500 per cubic meter. If the company uses ground water, it will further increase the company's costs so that these two buildings no longer used water supply from wells. With regard to the cost of liquid waste treatment, the average percentage of cost allocation by companies from the three companies varies greatly depending on the inlet-outlet difference of each contaminant. The highest cost allocation for wastewater treatment is X building because of the high level of water used and the amount of waste produced, next is Y building and the lowest is Z building.

Pigovian Tax Value Estimation

The marginal additional cost of reducing waste concentration has a negative coefficient (slope) for BOD, COD, Organic, TSS parameters in buildings X, Y, and Z, this indicates that any reduction in the concentration of BOD, COD, Organic, and TSS parameters will increase the additional costs incurred by the company and vice versa if the company's activities turn out to have an impact on increasing the concentration of BOD, COD, Organic, and TSS then it will reduce the additional costs in reducing the concentration of liquid waste parameters.

Referring to the research results, the concentrations of BOD, COD and organics from X do not meet drinking water quality standards. It can be interpreted that even though the liquid waste is treated to the liquid waste quality standards required by the government, the community is still affected by contamination because the waste water is channeled into the river body. In buildings Y and Z, the results of the study also showed that the concentrations of BOD, COD and organics did not meet drinking water quality standards, but the treated wastewater that flowed through the pipeline provided by the government led to the Setiabudi Reservoir, so there were difficulties in estimating the losses borne by the community because the waste has been mixed with other household/industrial waste. The concentration values of BOD, COD, organic, TSS which are still above the drinking water quality standards can have a negative impact on public health conditions. High concentrations of COD and BOD in water indicate the presence of large amounts of organic pollutants. In line with this, the number of microorganisms, both pathogenic and non-pathogenic, is also high in quantity. Pathogenic microorganisms can cause various diseases in humans. Therefore, it can be said that high concentrations of COD and BOD in water can cause various diseases for humans, including skin diseases, respiratory tract, diarrhea and lower body immunity. Determination of Suspended Solids (TSS) is useful to determine the strength of pollution of domestic wastewater, and is also useful for determining the efficiency of water treatment units. Solids are always present in water and if dissolved in large quantities it is not good for drinking water. Deviations from water quality standards will result in unpleasant odors and cause stomach ailments.

The value of the loss borne by the community due to the concentration of parameters that are still above the quality standard has an impact on the community around X building. The highest average cost allocated by the community as a result of pollution is for the purchase of gallons of water and water filters, due to contamination of well water with water waste, besides that the impact is the cost for treatment due to skin diseases and diarrhea. The additional cost of damage felt by the community due to an increase in the value of the concentration of contaminants produces a positive coefficient, meaning that the higher the level of contaminants, the additional damage costs incurred by the community will be higher. The coefficient value of the marginal damage cost as a result of contaminating concentrations of X building liquid waste is the highest for the Organic indicator, followed by BOD and the lowest is COD. Specifically, for the Organic parameter at STP B and TSS at STP A and STP B, the coefficient values are negative, meaning that the higher the concentration of liquid waste, the additional cost of damage to society will decrease. The coefficients with a negative sign on the special TSS liquid waste concentrate in X building, namely STP A and STP B, are 6.5 mg/l and 5.25 mg/l indicating that WWTP X is processing it below the drinking water quality standards set by government of 50 mg/l. Likewise for organic concentrate, which is 9.08 mg/l, below the drinking water quality standard set by the government of 10 mg/l. The results of calculating the allocation of costs for reducing pollution are obtained by the value of Marginal Abatement Cost (MAC) and the negative externalities felt by the community as a result of water contamination are shown in the value of Marginal Damage Cost (MDC). In order for the aspect of justice to be created both from an economic, social and environmental perspective, it’s necessary to determine optimal tax and quantity of liquid waste based on financial allocations to reduce pollution from the company side and for negative externalities borne by the community. perspectives.

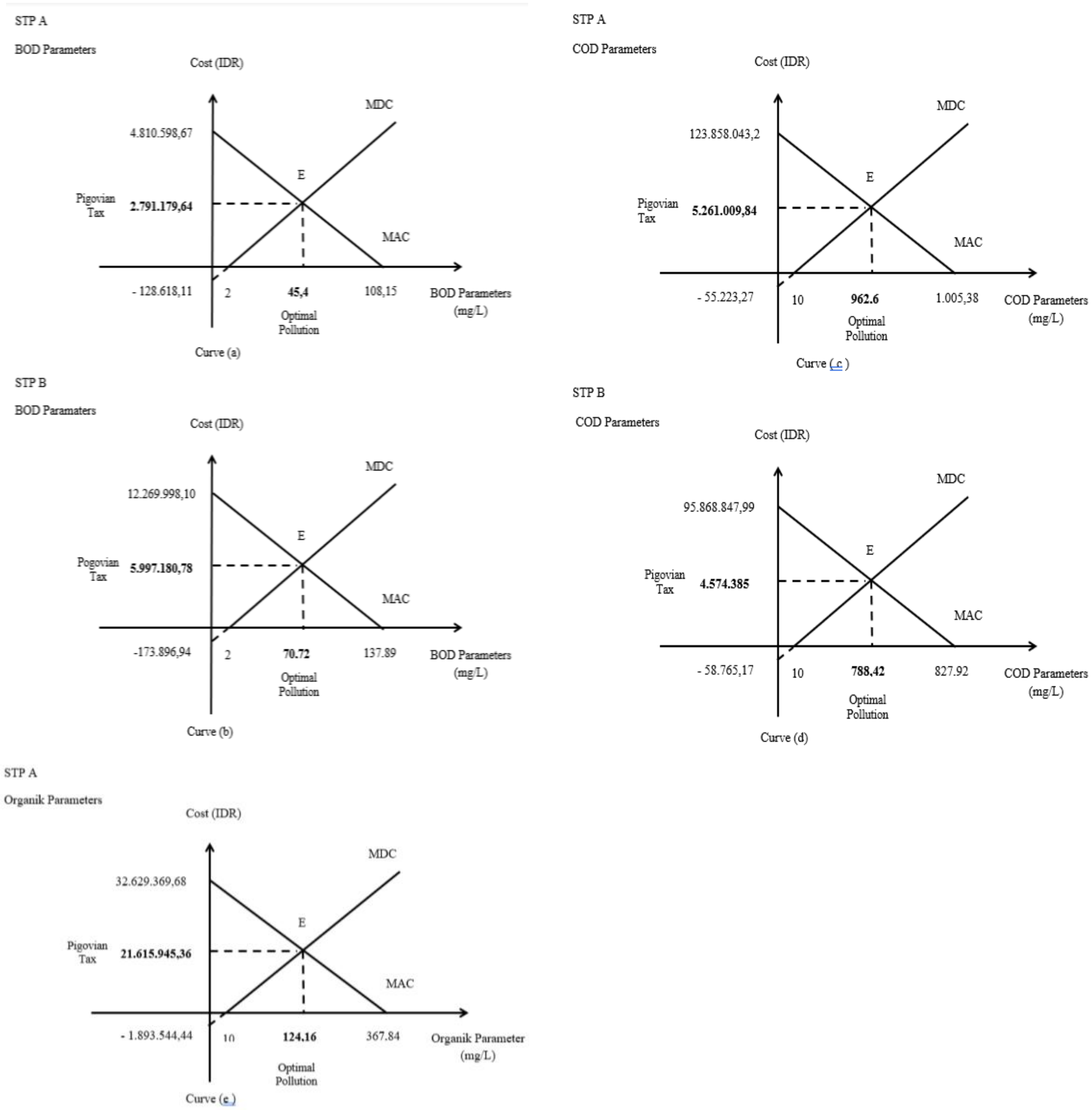

Figure 2. Equilibrium Curve of Marginal Abatement Cost (MAC) and Marginal Damage Cost (MDC) of X Building

Figure 2. above shows that both curves a, curve b, curve c, curve d, curve e for each parameter at STP A and STP B that the optimal tax and the most optimal pollution will be formed when the Marginal Abatement Cost curve (MAC) parameters BOD, COD and Organic intersect with the Marginal Damage Cost (MDC) curve. Point E or the equilibrium point is called the Pigovian function. If the government applies a tax below the optimal tax, it will be more profitable for polluting companies to pollute the environment because the cost of handling pollution will be smaller. This will encourage companies to produce more (excess supply) so that the impact on the level of pollution will increase and cause the cost of damage to be borne by the community due to contamination will be higher. Conversely, if the government applies a tax above the optimal tax, then for polluting companies it will reduce the amount of production so that the level of pollution to the environment decreases because the cost of handling pollution will be even greater. This will benefit the community because the level of pollution will decrease so that the cost of damage incurred by the community will be lower.

The environmental tax rate estimated by X building based on the number of outlets for 3 parameters BOD, COD and Organic. Of the three parameters that have the highest optimal concentration is COD of 875.56 mg/l while the highest optimal tax is for organic parameters of IDR. 21,615,945 and the highest average outlet tax per 1 mg/l is organic of IDR. 1,897,662 ,75. Overall, the amount of estimated tax that must be paid by PT. X is IDR 2,433,571.32/month or if it is estimated that in a year the total tax payment for liquid waste is IDR 29,202,855.84. If seen from the amount of tax estimated, it shows that X building management is trying to reduce the level of contamination of liquid waste flowing into the river so that the impact on society and the environment is not too bad. This is proven by the existence of organic indicators at STP B and TSS at STP A and B, the processing of which reaches drinking water quality standards.

Table 1. Estimated Average Liquid Waste Tax Rate X July 2018 - June 2019 Period

Parameters	Optimal Concentration Average (mg/l)	Optimal Tax Average	Tax Everage per 1 mg/l	Tax *Outlet Average* per 1 mg/l (IDR)
BOD	58,06	4.394.180,21	73.140,75	310.847,87
COD	875,56	4.917.697,48	5.633,47	225.060,7
Organik	124,16	21.615.945	174.097,5	1.897.662,75
Total Liquid Waste Tax Rate/month				**2.433.571,32**
Total Liquid Waste Tax Rates for the July 2018 to June 2019 Period				**29.202.855,84**

The conclusion obtained referring to the results of this study is that it is proven that the determination of waste tax rates on commercial buildings produces an optimum value.

Discussion

Based on the results of the study it was found that there was a positive externality with the used of a Wastewater Treatment Plant (WWTP) which had an impact on employment absorption (Henderson, 2012; Herman, 2011; Martinuzzi et al., 2011; Sovacool et al., 2021), cost efficiency and reuse of treated waste products (Liu, 2015; World Green Building Council, 2013; Sovacool et al., 2021). Meanwhile, cost efficiency in the used of resources will increase profits for companies and encourage companies to invest, for example investing in new technology that can reduce pollution (Hojat & Rahim, 2012; Sovacool et al., 2021).

Industrial activities that use wastewater treatment have economic and environmental feasibility. WWTP is categorized as a project within a company to reduce damage caused by liquid waste pollution (environmental externality). So that accounting calculations must include costs of environmental degradation, resource cost inefficiencies, remediation costs (Suparmoko & Ratnaningsih, 2012; Zeng et al., 2019), as well as the benefits of waste treatment as a form of efficiency from an investment. This is important in order to know the economic and environmental feasibility. The results of the study show that companies used WWTP are economically and environmentally feasible, while companies that do not implement WWTP but used the services of a waste treatment company will only obtain environmental feasibility.

To reduce this contamination, the company/industry treats liquid waste below the required quality standard according to the Regulation of the Governor of DKI Jakarta Province Number 122 of 2005. Determination of the cost of liquid waste treatment consists of the amount of liquid waste produced, the amount of liquid waste concentration and the size of the building. The results of this research show that the marginal additional cost for reducing the concentration of liquid waste (marginal abatement cost) has a negative coefficient/slope. This means that the allocation of costs for treating contaminants will increase if the quantity of waste and pollution levels are higher. The higher the cost allocation for reducing contamination, the concentration of waste parameters will decrease, conversely if the lower the cost allocation for reducing pollution, the higher the concentration of waste parameters (Broekx, 2014; Dasgupta et al., 2001; Hojat & Rahim, 2012).

The additional cost of damage felt by the community (marginal damage cost) due to an increase in the value of the concentration of contaminants/pollution produces a positive coefficient meaning that the higher the level of contaminants, the additional damage costs incurred by the community will be higher (Edenhofer et al., 2021; Johnson, 1995; Masur & Posner, 2015). The results of the research show that from several parameters of wastewater used to estimate marginal damage, the coefficients are positive and negative. The coefficient is positive, meaning that the higher the concentration of liquid waste, the additional cost of damage to society will increase, because for this indicator, after being treated used WWTP, it is still above the quality standard for drinking water quality. While the coefficient is negative, meaning that the higher the concentration of liquid waste, the additional cost of damage to society will decrease, because for the indicator of liquid waste after being processed used WWTP, the outlet value is below the quality standard for drinking water quality according to Republic of Indonesia Government Regulation No.82/2001.

To build an efficient economic system that is environmentally sound, economic activities must internalize external costs. Negative externalities can be internalized into the company's production costs so that efficiency is expected to be achieved from the side of the company and society (Ziolo et al., 2019). The right combination of economic policy instruments, such as tax rates and subsidies is effective in correcting negative externalities (Park et al., 2012; Ziolo et al., 2019). The results showed that by used a equilibrium approach of marginal damage cost and marginal abatement cost (Edenhofer et al., 2021; Field, 1994; Khanna, 2003; Masur & Posner, 2015; Shin et al., 1997) the determination of wastewater tax rates and concentration levels of liquid waste parameters in commercial buildings produces optimum value.

The findings show that the estimated environmental tax rate of IDR 29,202,855.84 is also revenue for the government whose allocation can be used to improve environmental quality due to liquid waste pollution. The allocation can be in the form of subsidies or WWTP project assistance for companies. The tax rate also shows the amount of loss the government will not receive as a result if the environmental tax rate is not applied to polluting companies. If the Pigovian tax is implemented, the liquid waste tax policy will have an impact on shifting the tax burden to consumers. Imposition of taxes encourages increased costs so that companies will allocate a portion of the tax burden to consumers who used the building, namely by increasing rental costs.

Improving environmental quality by demonstrating reduced pollution requires the intervention of the private sector. Support from the private sector with the application of the Green Building concept in creating an environmentally friendly industry needs the attention and support of the government (Tomislav, 2018). Government intervention in the form of regulations in encouraging developers to build buildings or renovate buildings based on the green building concept is (i) providing incentives for conventional buildings that lead to the application of green building so that Eco Industry is expected to be created and support sustainable development, (ii) As for industries that have implemented the green building concept, it is hoped that the government can provide facilities in the form of reducing the amount of liquid waste tax, so that it will reduce operational costs (Bungau et al., 2022; Tomislav, 2018). This tax deduction can be allocated to add waste recycling technology or water-saving equipment. Because technological changes will affect the formation of well-being so that it will also have an impact on sustainable development (Hamilton et al., 1998). Green building is a sustainability tool to support the achievement of sustainable development goals (Bungau et al., 2022).

CONCLUSION

Based on the research results, it can be concluded that; (1) there are positive externalities in the form of the absorption of labor in buildings that used Liquid Waste Treatment Plants (WWTP), cost efficiency and reuse of wastewater treatment results in the form of gardening, car washing, cooling towers, and reverse osmosis for companies, (2) commercial building activities that carry out liquid waste processing have economic and environmental feasibility. For X and Y buildings, it was concluded that the wastewater treatment projects at these two companies have economic and environmental feasibility, (3) there is an increase in the value of contamination in commercial buildings that carry out liquid waste processing. Even though the trend of polluted values is experiencing fluctuating developments, (4) there is an increase in company costs to reduce the one-unit concentration of liquid waste parameters (Marginal Abatament Cost / MAC) in commercial buildings that carry out liquid waste treatment, (5) there are additional damage costs incurred by the community due to liquid waste pollution (Marginal Damage Cost / MDC) from commercial building activities that carry out liquid waste treatment, (6) determination of the waste tax rate on commercial buildings produces an optimum value by used the MDC and MAC equilibrium approach, and (7) liquid waste treatment installations invested by the company and the allocation of sustainable processing costs, both provided by the private sector and those established by the government, greatly help reduce the level of contamination of liquid waste that flows into rivers and provide direct or indirect benefits for the company itself. However, the level of contamination that has not been processed up to the quality standard for clean water causes river water to be polluted and causes the community's well water to be contaminated. For this reason, the government needs to implement fiscal policies in implementing liquid waste taxes so that justice is created for both pollution companies and the community.

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