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Valuation of the Economic Impact of Air Pollution to Promote Public Welfare in Jakarta

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Abstract: *This research aims to conduct a valuation analysis of the economic impact of air pollution in Jakarta. Using mapping from satellite imagery and the 2016 Input-Output table which was iterated using the RAS Partial Survey method to become the 2023 Input-Output table. From the results of research that uses the impact (shock) of the implementation of the weak complimentary which is reflected through the environmental adjustment tax (EAT), The results showed that air pollution in Jakarta contributed negatively to the economy amounting to IDR 8,981,659,208,407,380.00. Based on the results of the income and output multiplier analysis, various results were obtained, but the extractive sector was better able to operate without weak complimentary and the results of linkage and mapping proved that the Wholesale and Retail Trade sectors; Car and Motorcycle Repair; Transportation and Warehousing; and Government Administration, Defense, and Social Security must contribute maximally to air pollution in West Jakarta, Central Jakarta, North Jakarta, and South Jakarta. The recommendation from this research is the need for policy synergy between Jakarta, the business world, academics, media, and community leaders by creating a 3P (People, Planet, Profit) Jakarta Plan to solve pollution and environmental problems in Jakarta.*

Keywords: *Air Pollution; Input-Output Table; Satellite Imagery; Weak Complimentary*; *3P Jakarta Plan*

1. Introduction

As one of the most populous cities in the world, Jakarta is experiencing serious problems in handling air pollution where data (BPS RI, 2023) shows that the population density in Jakarta is 13,667.01 people per km2. Jakarta is also the province with the fastest population growth and economic activity, which dominates the national economy. However, industrial activities in Jakarta also add complexity amidst the massive use of transportation for community mobility. Industrial and transportation activities in Jakarta also impact increasing emissions of air pollutants such as PM2.5, SO2, NOx, and CO2 which can threaten public health and have implications for community productivity. High health costs, reduced productivity, economic losses, and decreased environmental quality can be direct and indirect costs that will reduce the economy of Jakarta and Indonesia (World Bank, 2018).

The Jakarta Government needs to make efforts to synergize in policymaking to maintain an equilibrium between economic growth and environmental sustainability by carrying out several interventions (Todaro & Smith, 2018). Negative externalities that occur

in Jakarta e due to industrial waste, greenhouse gas effects, and pollutants can become opportunities for new economic growth if they can be managed well. The use of interventions with an R&D approach through appropriate technological innovation and digitalization can be an alternative tool using a weak complementary approach (Banzhaf, 2020). Therefore, research is needed that can conduct an economic valuation study of the impact of pollution in Jakarta and the potential for applying the weak complementary concept to map public health, decreased productivity, and other economic losses using a multidisciplinary approach that combines technology, economics, public policy to present an applied base policy which can become the basis for economic policymaking and the impact of economic losses due to pollution which can strengthen the economic base in Jakarta. This research needs to be carried out to evaluate the impact of negative externalities on the economy in Jakarta due to air pollution, especially those that impact the health sector. Sectors that are considered enablers in the economy in Jakarta also need to be evaluated whether they are positive or negative externalities in the economy to find out the right public policy to protect the people in Jakarta.

2. Literature Review

2.1. Natural Resource and Environmental Economics

Environmental Economics pays attention to the scarcity of natural resources in sustainable economic development and also highlights the importance of environmental costs which will have long-term destructive impacts (Dasgupta, 2001; Stern, 2006. The implementation of a carbon tax scheme as a form of disincentive and green subsidies as an incentive that can encourage circularity activities is important because it will correct market failure due to the negative externalities that occur (Hanley et al., 2003; Pearce & Turner, 1990). Therefore, the development of clean technology and the promotion of sustainable economic growth are relevant to use as a holistic framework to guide policymaking that can encourage economic growth and conservation of natural resources and the environment (Acemoglu et al., 2012).

2.2. Air Pollution

Air pollution has become a matter of great concern to humans in recent decades. This can be seen from several regulations that have been issued by governments around the world, such as regulations regarding clean air in England which were issued in 1956 due to the smoke tragedy in the City of London which killed around 4,000 people in 1952. The United States also issued regulations regarding air pollution in 1955. Before the 1950s, air pollution was a big problem in industrial areas, where coal was used as fuel which consisted of several air-polluting particulates. Indonesia itself has issued regulations related to air pollution control which are regulated through Government Regulation of the Republic of Indonesia Number 41 of 1999 which consists of 59 articles (Machdar, 2018).

Air pollution is the entry or introduction of substances, energy, and/or other components into the ambient air by human activities so that the quality of the ambient air drops to a certain level which causes the ambient air to be unable to fulfill its function. The entry of pollutants into the air can occur naturally, such as smoke from forest fires, volcanoes, meteorite dust, salt emissions from the sea, and so on. Air pollution can also be

caused by human activities, such as air pollution due to transportation activities, industry, and waste disposal, both during decomposition and when household waste is burned (Soedomo, 2001). Air pollution can usually be influenced by several factors, one of which is climate factors. Wind speed, air temperature, and air humidity are part of the meteorological parameters that can influence the concentration of pollutant gases in the air (Istantinova, et al 2013). High air temperatures will cause air pollutants in the form of particles to become dry and light so they last longer in the air (Kurniawati, et al 2017). Here are some air pollutant particles and their impact on health:

Table 1. Pollutant Particles

Pollutants	Main Sources	Main Health Impacts
Particulate Matter (PM10, PM2.5)	Vehicle emissions, biomass burning, industry	Respiratory disorders, cardiovascular disease
Nitrogen Dioksida (NO_2)	Vehicle emissions, power generation, industrial processes	Respiratory tract irritation, decreased lung function
Sulfur Dioksida (SO_2)	Fossil fuel burning, industry, power generation	Respiratory problems, eye irritation, lung damage
Karbon Monoksida (CO)	Incomplete fuel combustion, motor vehicles	Binding with hemoglobin decreases oxygen in the blood

2.3. Air Pollution Index

Ambient air quality can also be evaluated using the Air Pollution Standard Index (ISPU) value. According to (Permen KLHK Republik Indonesia, 2020), the ISPU value is a unitless number that describes the condition of ambient air quality in a particular location, which is based on the impact on human health, aesthetic value, and other living things.

Table 2. Conversion of Concentration Values to the ISPU Index

Range	Category	Explanation
1-50	Good	The air quality level is very good, has no negative effects on humans, animals and plants
51-100	Fair	Air quality levels are still acceptable for human, animal and plant health
101-200	Unhealthy	Air quality levels that are detrimental to humans, animals and plants
201-300	Very Unhealthy	Air quality levels that can increase health risks in a number of exposed segments of the population
301+	Hazardous	Air quality levels that can seriously harm the health of the population and require immediate treatment

In 2020, the Ministry of Environment and Forestry issued Minister of Environment and Forestry Regulation number 14 of 2020 concerning the Air Pollution Standard Index which is a replacement for Minister of Environment Decree no. 45 of 1997 concerning Calculation and Reporting and Information on Air Pollution Standard Indexes. In this replacement regulation, it is stated that ISPU calculations are carried out on 7 (seven) parameters, namely PM10, PM2.5, NO2, SO2, CO, O3, and HC. There are additional 2 (two) parameters, namely HC and PM2.5, from the previous regulations. The addition of these parameters is based on the large risk of HC and PM2.5 on human health.

Apart from adding parameters, there has been an increase in the frequency of delivering ISPU information to the public. The ISPU calculation results for PM2.5 parameters are submitted to the public every hour for 24 hours. Meanwhile, the ISPU

calculation results for PM10, NO2, SO2, CO, O3, and HC parameters are presented to the public at least 2 (two) times in 1 (one) day at 09.00 and 15.00. The following is a conversion table for ISPU parameter concentration values.

2.4. Weak Complimentary

Weak Complimentary is a concept in economic activity that can be used to explore policy interventions, one of which is regarding the context of air quality that affects economic and environmental dynamics by measuring better technological efficiency or cost reductions in one sector can reduce pressure on resources or various economic sectors (Barrett, 1994). Interventions regarding air pollution reduction such as the use of carbon taxes or strict emission standards have the potential to influence production and consumption decisions in the economic sector (Goulder & Parry, 2008) which is shown in research (Popp, 2002) on the economic impact of air pollution regulation policies can encourage technological innovation depending on the industrial structure and adaptability (Fullerton & Wolverton, 2005).

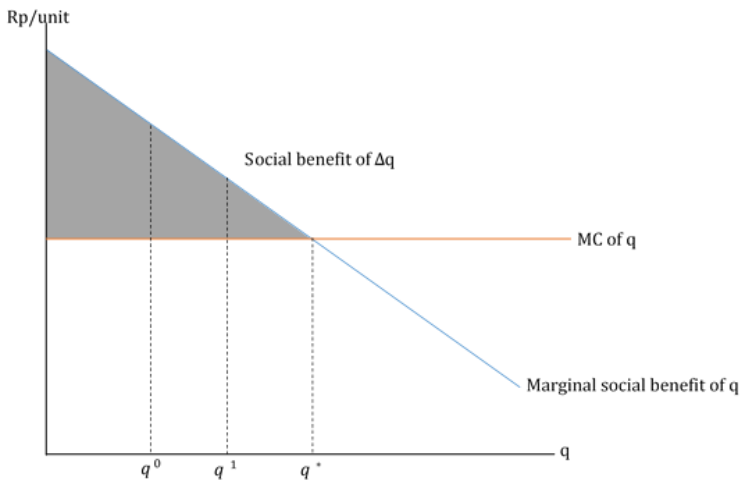

Figure 1. Weak Complimentary Concept
Source: Banzhaf (2020)

The concept of weak complimentary is important because it will discuss the trade-off between controlling pollution and economic growth but further research is needed regarding forms of policy intervention that are relevant but still optimize aspects of economic growth (Helm et al., 2010).

2.5. Input-Output Table

The input-output table is a description of the interactions between several economic sectors (Johnson (2017) measures the multiplier effects and changes in certain sectors, and highlights a more efficient allocation of data sources (Mohr, 2018). In national economic planning, the Input-Output table provides the basis for decision-making in economic planning and is an important instrument in evaluating economic policies in the development of the industrial sector (Abu-Bader & Jones, 2021; Gregorio-Rodríguez et al., 2018). In this research, the input-output table is used to evaluate the economic impact of air pollution in

Jakarta. Negative externalities originating from sectors in Jakarta need to be assessed to carry out useful evaluations to assess whether the policies implemented to encourage a sector will have implications for greater public losses.

3. Research Method

3.1. Data and Source

This study is needed that conduct an economic valuation study of the impact of pollution in Jakarta and the potential for applying the weak complimentary concept to map public health, decreased productivity, and other economic losses using a multidisciplinary approach that combines technology, economics, public policy to present an applied base policy which can become the basis for economic policy making and the impact of economic losses due to pollution which can strengthen the economic base in Jakarta. This research uses the following data and data sources:

Table 3. Data and Data Source

NO	Data	Sumber Data
1.	Input-Output Table 2016 BPS RI	BPS RI
2.	Air Quality Index Data	Ministry of LHK RI
3.	Satellite Imagery Data	Modis & Sentinel 5P
4.	Jakarta Air Quality Report	Jakarta Provincial Environmental Agency
5.	Road and Vehicle Density Data	Google Traffic Time Series Data

Source: Various Source (Processed)

3.2. Input-Output Table

In the Input-Output table, according to (BPS RI, 2010) the Input-Output model can be formulated as follows:

$$Z_i = M_i + X_i = ‚Ä¶W_i + Y_i Z_i = M_i + X_i = ‚Ä¶W_i + Y_i \quad (1)$$

$$X_j = ‚Ä¶X_{ij} + V_j = U_j + V_j X_j = ‚Ä¶X_{ij} + V_j = U_j + V_j \quad (2)$$

Equation (1) shows the balance between demand and supply in economic activity, while equation (2) shows the balance between the amount of production in each sector with the input prices of other sectors and added to the added value of the related sector. Input – output analysis tools allow extended analysis using forward and backward linkage concepts.

Backward linkage analysis is considered important to have an understanding of the interdependence of industries and supply chains which is useful in analyzing the impact of changes in an industry and industry on products or services. On the other hand, forward linkage analysis is needed to analyze the value chain. The concept of forward linkage proposed by (Porter, 1980) also explains the concept of value chain theory and sees significant economic benefits for a company.

3.3. Data Scrapping

The methodological approach of this study begins with the collection and processing of large-scale price data through Big Data Analytics. Python's powerful libraries, such as Pandas for data manipulation, Beautiful Soup for web scraping, and NumPy for numerical operations, play a crucial role in this process. Pandas facilitate the cleaning and structuring

of data, ensuring that it is in a suitable format for analysis. Big Data Analytics extends beyond data collection to include the processing and analysis of the vast amounts of information gathered.

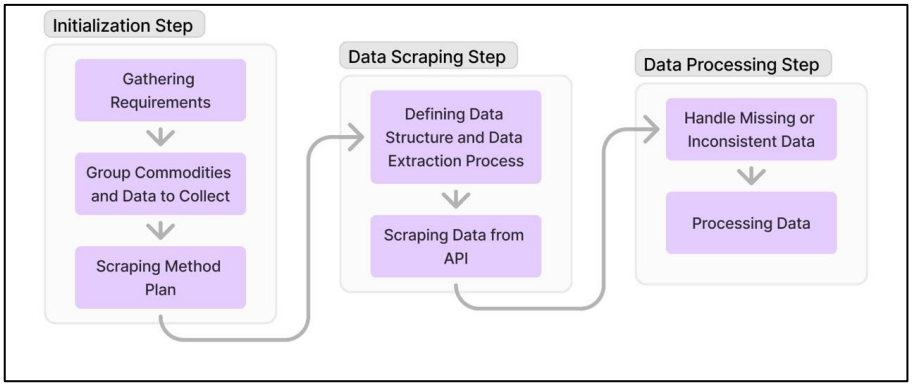

Figure 2. Data Scrapping Steps

This approach facilitates the identification of trends and patterns that might not be evident in smaller datasets, providing a more granular understanding of market dynamics. The integration of Big Data Analytics with traditional economic modeling methods. Advanced data imputation techniques and machine learning algorithms can be employed to fill gaps in the data, ensuring that the final dataset is as complete and accurate as possible. This level of detail and accuracy is essential for conducting meaningful analysis.

3.4. Scenario Simulation

This research uses the Input-Output table from the 2023 iteration, where the latest publication from (BPS RI, 2016) is the 2016 Input-Output table and analyzes the impact of output, multipliers, and interlinkages between sectors in this research. The shock used in this research is the Environmental Adjustment Tax scheme which uses the DKI Jakarta Province air quality index (Ministry of Environment and Forestry of the Republic of Indonesia, 2023) as the magnitude of changes in the economic sector which is the form of choice. the policy of implementing the weak complementary concept (Susilo et al., 2023).

4. Result and Discussion

4.1. Results of Analysis of the Impact of Air Pollution on 17 Economic Sectors

Based on the results of the output impact analysis, air pollution in Jakarta has a negative impact on 14 economic sectors and a positive impact on only 3 economic sectors, namely Agriculture, Forestry, and Fisheries; Electricity and Gas Procurement; and Health Services and Social Activities. Several sectors affected by air pollution in Jakarta can be concluded that air pollution in Jakarta is the impact of electricity generation which is shown through the Electricity and Gas Procurement sector and also electricity demand due to the use of air coolers and other air conditioners. An increase in the Health Services and Social Activities sector is a form of negative externality of air pollution which has an impact on public health.

Table 4. Results of Analysis of the Impact of Air Pollution on the Economy DKI Jakarta Province

Sector	Impact on Output
Agriculture, Forestry, and Fisheries	Rp13.657.144.116,88
Mining and Quarrying	-Rp18.408.208.190,80
Processing Industry	-Rp1.639.348.609.582.200,00
Electricity and Gas Supply	Rp2.170.391.397.049,07
Water Supply, Waste Management, Waste and Recycling	-Rp1.353.018.405,76
Construction	-Rp948.552.947.989.012,00
Wholesale and Retail Trade; Car and Motorcycle Repair	-Rp2.864.040.265.125.050,00
Transportation and Warehousing	-Rp305.943.036.215.520,00
Provision of Accommodation and Food and Beverages	-Rp50.480.402.512.257,20
Information and Communication	-Rp788.914.342.807.955,00
Financial Services and Insurance	-Rp1.488.835.186.702.380,00
Real Estate	-Rp345.572.966.122.743,00
Corporate Services	-Rp285.002.425.591.775,00
Government Administration, Defense and Mandatory Social Security	-Rp8.654.731.688.417,24
Education Services	-Rp64.389.805.792.418,60
Health Services and Social Activities	Rp22.253.420.715.393,70
Others Services	-Rp216.342.196.307.611,00

The increase in the Agriculture, Forestry, and Fisheries sectors is a real form of well-functioning carbon trading in Jakarta, but it has not had a significant direct impact on the economy because the gap in the impact of air pollution in Jakarta is -Rp. 8,981,659,208,407,380.00 (potential carbon market that can be exploited). The most dominant sector causing air pollution in Jakarta is the Government Administration, Defense, and Compulsory Social Security because it still results in economic losses in the Water Supply, Waste Management, and Waste and Recycling sectors. Therefore, the Government needs to deepen and evaluate public policies, especially on incentives or disincentives in industries or sectors that contribute highly to air pollution in Jakarta.

4.2. Air Pollution Mapping Analysis Results

Air pollution in Jakarta has experienced an alarming increase in recent years. Based on data from 2022-2023, there is a significant increase in concentrations of major air pollutants such as carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). The most significant increase occurred in the DKI3 and DKI4 areas, with the distribution of PM2.5 and PM10 particles also showing an increase in almost all observation stations belonging to the DKI Jakarta Provincial Government during 2023.

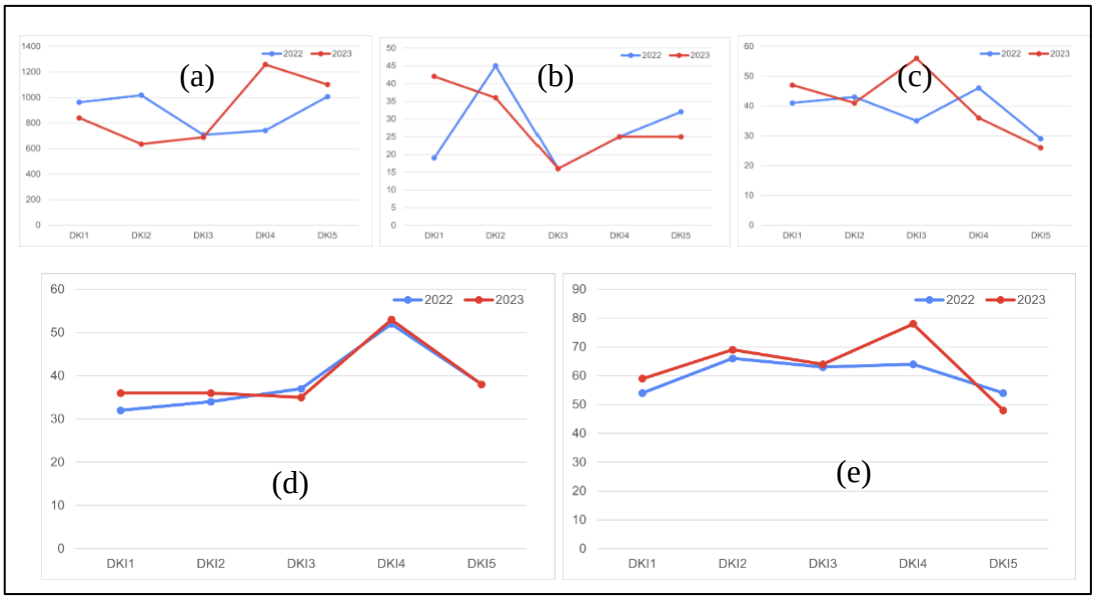

Figure 3. (a) CO; (b) NO2; (c) S02; (d) PM 2,5; (e) PM 10

Table 5. **Distribution of Air Quality Monitoring Stations for DKI Jakarta Province**

NO	Station Name/Location/Destination
1	DKI1/Bundaran HI - Central Jakarta / Road Side
2	DKI2/Kelapa Gading - North Jakarta / Commercial Area
3	DKI3/ Jagakarsa - South Jakarta / Residential
4	DKI 4/ Lubang Buaya – East Jakarta / Mixed
5	DKI5/ Kebon Jeruk – West Jakarta / Residential

Analysis of satellite image data shows that the increase in air pollutants mainly occurs in the dry months, namely from May to October. During this period, almost the entire Jakarta area experienced a very significant increase in pollutants. Jakarta and parts of Tangerang are the areas with the worst levels of pollution during the dry season. This increase was caused by various factors, including massive motor vehicle activity and industry spread across the JABODETABEK area.

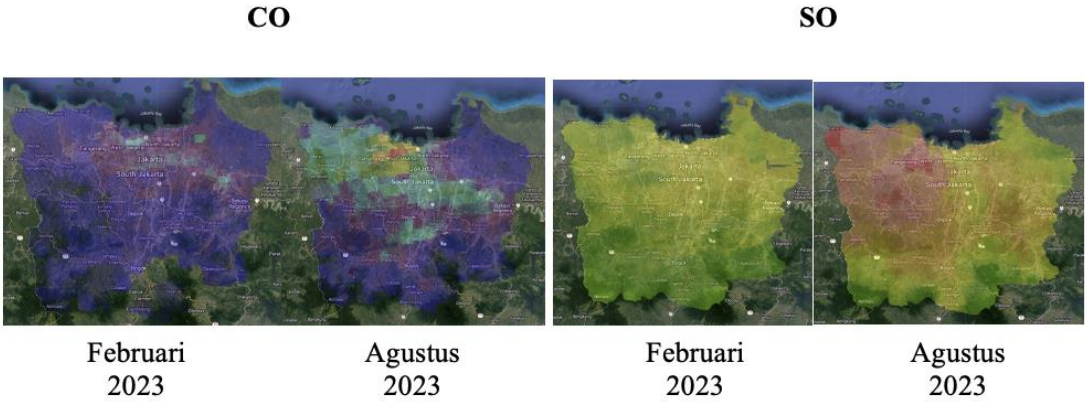

Figure 4. JABODETABEK CO and SO mapping February and August 2023

Traffic density data shows that most of the areas with high levels of pollutants are in the areas of West Jakarta, Central Jakarta, and South Jakarta. High motor vehicle activity in

these areas contributes significantly to increased air pollution. Apart from that, industries in the region also make a large contribution to pollutant emissions.

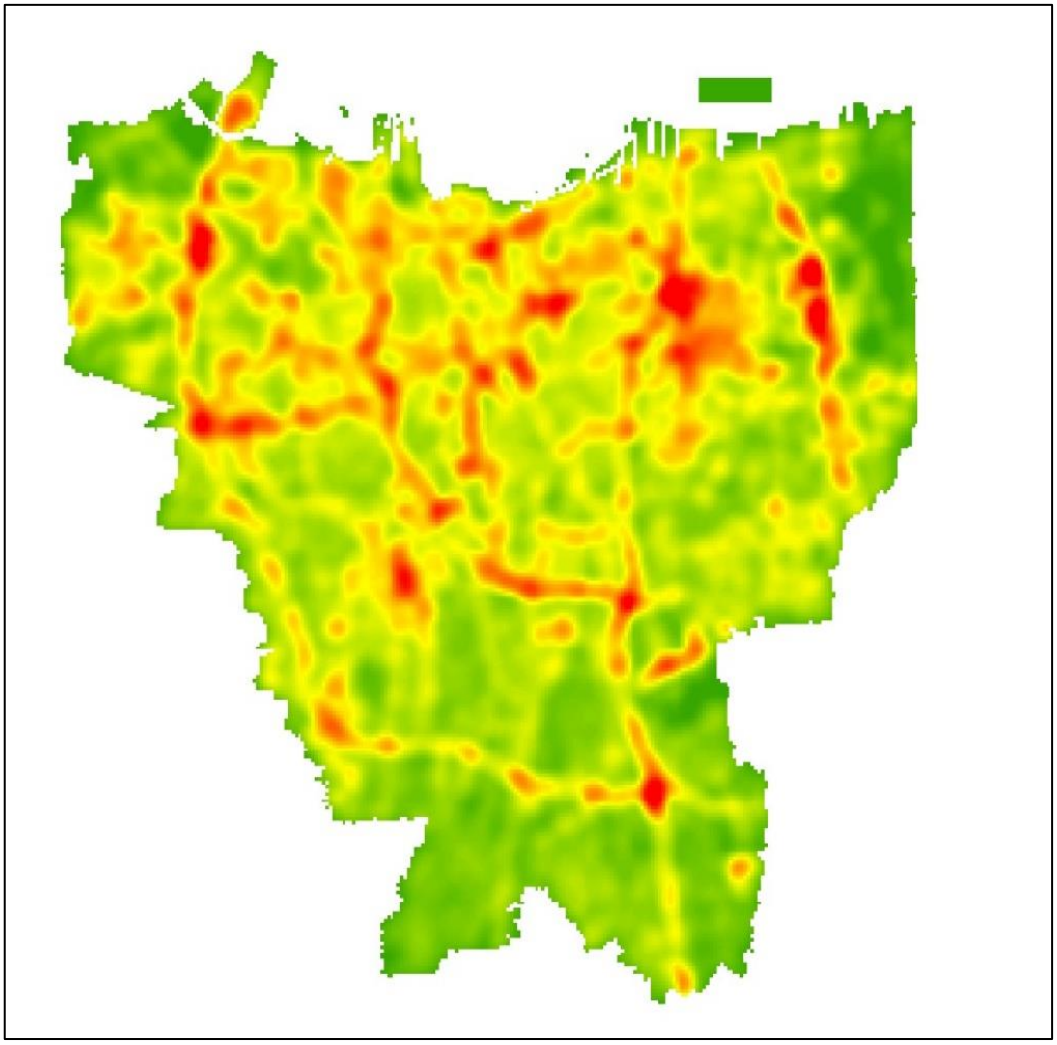

Figure 5. Jakarta Traffic Density in 2023

The increase in air pollution in Jakarta not only has an impact on public health but also has significant economic implications as in the results of Table 1. This economic impact can be seen from various perspectives, especially the increase in the need for hospitals, electricity, and gas while other economic factors tend to experience a slowdown and even massive losses. High air pollution causes an increase in the incidence of respiratory diseases such as asthma, bronchitis, and chronic obstructive pulmonary disease (COPD). Apart from that, Jakarta as the capital of Indonesia is also a tourism destination. However, high air pollution can reduce the city's attractiveness to tourists. Tourists may be reluctant to visit areas with poor air quality, which in turn can reduce tourism sector revenues. The decline in the number of tourists has an impact on the income of hotels, restaurants, and other tourism-related businesses. Therefore, the impact of air pollution on Jakarta's economy is very complex and requires serious handling (Ratraningsih, 2007).

4.3. Results of Income and Output Multiplier Analysis of the Weak Complimentary Concept

Table 6. Results of Income and Output Multiplier Analysis

Sector	Income Multiplier		Output Multiplier	
	2023 (Without Weak Complimentary Concept)	2023 (With the Weak Complimentary Concept)	2023 (Without Weak Complimentary Concept)	2023 (With the Weak Complimentary Concept)
Agriculture, Forestry, and Fisheries	0,993673133906444	0,99371006382492	0,98792930201279	0,9879506556859
Mining and Quarrying	0,721768577221775	0,721242523294017	1,087507656551	1,0875318847213
Processing Industry	2,98	2,98	1,088505656351	1,08753188472135
Electricity and Gas Supply	0,218222859214985	0,220671617407238	5,8674554412958	5,86757449432746
Water Supply, Waste Management, Waste and Recycling	0,945486733204943	0,945509364172472	0,58520247824695	0,85213493193193
Construction	3,796	3,796	5,4766779509246	5,46816113612371
Wholesale and Retail Trade; Car and Motorcycle Repair	6,468	6,468	5,36943053368413	5,36629562044293
Transportation and Warehousing	1,118	1,118	3,670092512221	3,66698364157136
Provision of Accommodation and Food and Beverages	1,318	1,318	2,7237673354725	2,8021830474969
Information and Communication	2,489	2,489	1,7821090371444	2,06470899059521
Financial Services and Insurance	3,249	3,249	1,23781567071598	0,975973783638087
Real Estate	1,038	1,038	3,03980569239367	2,83006580040019
Corporate Services	0,102	0,102	1,8547940777499	2,03594911960871
Government Administration, Defense, and Mandatory Social Security	0,558851086954854	0,558384406021439	0,221411574016717	0,241968158400683
Education Services	2,75	2,75	2,1916796119879	2,39143476964016
Health Services and Social Activities	0,68	0,68	3,1015926034831	3,41984784457585
Others Services	1,014	1,014	3,18311708882313	3,51214811977316

Information		Best Scenario

In the results of the income multiplier analysis, unique and varied results were obtained between economic sectors. Based on the results of the income multiplier analysis, sectors with a value of >1 have a multiplier value in the economic sector and <1 do not have a multiplier value in the economy. Several sectors have been proven to experience an improvement in the income multiplier number even though the value remains <1 (does not have a multiplier value) but the Environmental Adjustment Tax scheme can be implemented, the Weak Complimentary concept will provide an improvement in the income multiplier in the Agriculture, Forestry, and Fisheries sectors; Procurement of Electricity and Gas; Water Procurement, Waste Management, Waste, and Recycling.

The results of the income multiplier analysis also show that extractive sectors such as Mining and Quarrying are better run without the concept of Weak Complimentary and again show that the Government Administration, Defense, and Compulsory Social Security sectors are also sectors that have implications on air pollution in DKI Jakarta Province. Results of analysis of the output multiplier in the Manufacturing Industry sector; Construction; Transportation and Warehousing; Financial Services and Insurance; and Real Estate is a sector that is better run without the Environmental Adjustment Tax (EAT) scenario. This is not yet proof that the air pollution that occurs is caused by the lack of economic circularity and even good green financing in DKI Jakarta Province (Susilo et al., 2023).

4.4. Results of Forward Linkage and Backward Linkage Analysis of Weak Complimentary Concepts

This research needs to be carried out to evaluate the impact of negative externalities on the economy in Jakarta due to air pollution, especially those that impact the health sector. Sectors that are considered enablers in the economy in Jakarta also need to be evaluated whether they are positive or negative externalities in the economy to find out the right public policy to protect the people in Jakarta. Based on the results of the forward linkage analysis, it is known that only 2 economic sectors are better off without the Environmental Adjustment Tax scheme, namely the Agriculture, Forestry, and Fisheries sectors and the Processing Industry sector. Based on the analysis results, the real estate sector will be the sector that provides the most significant added value when the weak complementary concept is implemented for policy intervention, namely 10.61.

In the results of the backward linkage analysis, the results showed that all sectors were proven to run better by applying the weak complementary concept, especially for the Agriculture, Forestry and Fisheries sectors which provided an economic spread to other sectors of 3.45 but there were 4 sectors whose value was still <1, namely Government Administration, Defense and Mandatory Social Security sectors; Education Services; Health Services and Social Activities; and other services that do not provide backward linkage to other sectors (Susilo et al., 2023).

Table 7. Results of Fler and Bler Analysis

Sector	FLER		BLER	
	2023 (Without Weak Complimentary Concept)	2023 (With the Weak Complimentary Concept)	2023 (Without Weak Complimentary Concept)	2023 (With the Weak Complimentary Concept)
Agriculture, Forestry, and Fisheries	0,995590042689674	0,99435123895263	3,1265835302224	3,45036336791221
Mining and Quarrying	1,38174042977812	1,38246135412626	3,02610958393157	3,34988865374571
Processing Industry	2,60216098396759	2,53351391530274	3,02609895741896	3,34987718111261
Electricity and Gas Supply	0,519267691169285	0,677109809114087	2,98757115745337	3,31148668491939
Water Supply, Waste Management, Waste and Recycling	1,05646608151336	1,05714209692101	2,98315593317880	3,30660980406894
Construction	1,22676826777523	1,50640689806934	2,98318229926128	3,30663877441057
Wholesale and Retail Trade; Car and Motorcycle Repair	4,34162638779451	5,07356232517329	3,08275320055225	3,4143677399772
Transportation and Warehousing	3,64980868256191	4,19288903044094	3,06100247669902	3,41303753065041
Provision of Accommodation and Food and Beverages	1,05147306222253	1,22364320124513	2,84516565722986	3,19512739157171
Information and Communication	4,93813279904195	5,54273387514914	2,74320153263068	3,08795306746409
Financial Services and Insurance	1,0888721924625	1,15261734225607	1,19243336521843	1,33505587030256
Real Estate	8,61949055769124	10,6108017055643	0,908924898363945	1,02713878994258
Corporate Services	3,1270140915321	3,49749317539685	0,931361026543128	1,05538560430925
Government Administration, Defense and Mandatory Social Security	2,47540403821575	2,7993629103582	0,216511994185498	0,271756996087674
Education Services	3,85945057385775	4,28606574231782	0,591508437937168	0,644021126062695
Health Services and Social Activities	4,82211133607966	5,37454420376625	0,462588878743208	0,501480410594682
Others Services	1,31216536592967	1,47911051046249	0,562134591416816	0,617112383256599

Information		Best Scenario

5. Conclusion and Policy Recommendation

Based on the results of the analysis of the impact of air pollution on 17 economic sectors, it can be concluded that air pollution in DKI Jakarta Province has a direct impact on reducing people's productivity in 14 economic sectors and contributes negatively to the economy amounting to IDR 8,981,659,208,407,380.00 but has a positive impact towards 3 sectors, namely the Agriculture, Forestry and Fisheries sectors; Procurement of Electricity and Gas; and Health Services and Social Activities. Air pollution mapping analysis using satellite imagery, it is confirmed that air pollution in Jakarta is high in all air pollutant particles, especially coming from the Wholesale and Retail Trade sectors; Car and Motorcycle Repair; Transportation and Warehousing; as well as Government Administration, Defense, and Mandatory Social Security which are very linear with the level of vehicle use which is also confirmed by the dense traffic density in DKI Jakarta in West Jakarta, Central Jakarta and South Jakarta.

Results of the income multiplier analysis, various results were obtained. Still, almost all sectors run well with the application of the Weak Complimentary concept. Still, extractive sectors such as Mining and Quarrying are better run without the Weak Complimentary concept and this again shows that the Government Administration, Defense, and Social Security sectors are also Compulsory. is a sector that has implications for air pollution in DKI Jakarta Province from output multiplier in the Manufacturing Industry sector; Construction; Transportation and Warehousing; Financial Services and Insurance; and Real Estate is a sector that is better run without the concept of weak complimentary. This is proof that the air pollution that occurs is due to the lack of economic circularity and even good green financing in DKI Jakarta Province.

Based Environmental Adjustment Tax scheme, namely the Agriculture, Forestry, and Fisheries sectors and the Processing Industry sector. Based on the analysis results, the real estate sector will be the sector that provides the most significant added value when the weak complementary concept is implemented, and from backward linkage analysis, the results showed that all sectors were proven to run better by applying the weak complimentary concept. Recommendation for Governments need to implement a weak complimentary scheme to balance economic growth and environmental sustainability in Jakarta by creating a 3P (People, Planet, Profit) Jakarta Plan which focuses on education and implementation of green energy, sustainable transportation, price discrimination against use of water and electricity, optimizing the waste sector, expanding green and city zones, as well as implementing a circularity economy based on science and technology (IPTEK) to reduce the impact of pollution in 17 economic sectors.

Evaluation for Jakarta Government must form a consortium of authorities under the Governor of DKI Jakarta Province which carries out studies, monitoring, and evaluation in circular management diagrams together with the ranks of the DKI Jakarta Provincial Government, the business world, academics, media and community figures to provide multiplier value and Maximum linkage to 17 economic sectors to provide public welfare. Regional Work Units (SKPD) of the DKI Jakarta Provincial Government must provide

education to the community through government administration activities to reduce negative externalities that occur in public to minimize the opportunity for greenflation to appear for the community.

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