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Analysis Impact Environment Product Biofuel Uses Life Cycle Assessment : Study Case Distribution Product Pertamax Green and Biosolar at Integrated Terminal Surabaya

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KEYWORDS
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ABSTRACT
In era globalization Which the more complex , challenge face change climate And damage environment has become very urgent. Research This aiming For analyze impact environment from production, distribution, and consumption biofuels, as well as determine strategy subtraction impact negative said. With use Life Cycle Assessment (LCA) method, research This do evaluation effectiveness And sustainability product biofuel in distribution. Products biofuel Which studied is Pertamax Green and Biosolar, which is case studies in Fuel Terminal Surabaya. Results study This show that distribution biofuel Also produce emission gas House glass (GHG) and pollution air Which potential bother environment. CO2 emissions and CH4 from process production And transportation biodiesel And bioethanol contribute on warmup global . For reduce impact environment, research This recommend implementation Vapor Recovery Unit (VRU) on terminal material burn oil (BBM) and optimization route delivery use Vehicle Routing Problem (VRP). In addition that, research This Also highlight importance regulation related to Life Cycle Assessment (LCA) for ensure sustainability energy national. With Thus, research This hope can give contribution real in reduce impact environment from industry energy in Indonesia.

1. INTRODUCTION

In era globalization Which the more complex , challenge face change climate And damage environment has become very urgent. Wrong One issue Which most significant is use energy Which No friendly environment, such as material burn fossil Which contribute on emission gas House glass (GHG) and pollution air. CO2 and CH4 is two gas House glass Which produced man to atmosphere Which can impact on warmup global. (Wagner & Walsh, 2006). When CO2 gas and CH4 mixed, the result is is CO2e, which is size Which has accepted in a way global For evaluate impact gas House glass to environment. (Karya & Sipil, 2014). Three source main pollution air Which due to by man is disposal waste, industry, and transportation (Ratnani, 2008).

Emission from industry energy estimated will Keep going increased, reaching 1,450 million ton on 2060, according to scenario Ordinary State (OS) from Pertamina Energy Institute (PEI) which use device soft named Low Emission Analysis Platform (LEAP). Emission sector energy reach the peak at 976 million ton on 2051 and Then down to 896 million ton on

year 2059, according to scenario Appropriate Sustainability (AS) (Pertamina Outlook Energy 2023-IDN, 2023). Total CO2 Emissions based on sector 2022 around 696.75 million tons of CO2, or grow around 14.8% compared to emission year 2021 (Riostantieka Mayandari Shoedarto, 2023).

Moment this , it is believed that progress energy renewable Also will give impact positive on resilience energy, creation field Work green, growth green, reduction damage environment consequence extraction, processing, and transportation material burn fossil , eradication poverty, and issues sustainability other (Edenhofer et al., 2013). Although so , not yet There is decline Which significant in use material burn fossil in a way global , including in Indonesia , which Keep going to be continued without stop (Harimbawa, 2016).

Legislation global require all entity corporate For disclose emission gas House glass them , so that handle challenge change climate And warmup global (Zulaikha, 2016). Ministry Energy And Source Mineral Resources (ESDM) stated that conservation energy And diversification energy is two axis Which become focus policy energy Indonesia (Sihombing, 2021).

Objective from conservation energy is For increase efficiency energy in sector transportation, industry, housing, and commercial from side supply and also demand. Diversification energy, in side other, aims For increase portion energy new And renewable in mixture energy. Law No. 30 concerning Energy And Regulation Government Regulation No. 79 of 2014 concerning Policy Energy National (KEN) released by government Indonesia on 2007.

Biofuel is Wrong One type energy renewable Which Possible can developed more carry on by Indonesia. Supply material burn For transportation is activity main PT Pertamina Patra Niaga Integrated Terminal Surabaya. However, in a number of year Lastly, the company has start emit more Lots funds in industry material burn clean or material burn friendly environment. Bioethanol, which donate about 60% of total request, is booster main biofuel, which estimated will increase on level around 8% per year (in global) to 2030. Biofuel very important For decarbonization sector transportation .

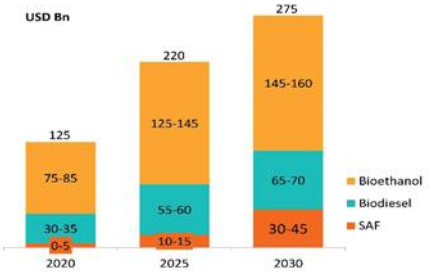

Figure 1. 1 Market Global (Pertamina Outlook Energy 2023-IDN, 2023)Biofuels

Obligation For mix biofuel has appear as strategy most popular For support material burn renewable in industry transportation, almost in a way Global. A total of 56 countries emit regulation about mixing biofuel on in 2022, some from countries This Also revise policy Which Already there are. Four country that is Argentina, India, Indonesia, and South Korea has increase target mandate biofuel or mixing they For 2022.

Figure 1. 2 Policy Global (Bariloche, 2023) Biofuels

Realize importance existence biofuel as well as potential negative Which caused as well as whether biofuel is replacement Which Good For material burn fossils, then need done strategy alternative Which can done in evaluate impact environment from process distribution biofuel through Life Cycle Assessment (LCA) method. Evaluation cycle life from energy, materials burn Which used, trash, and emission Which released to environment can identified And measured use method evaluation cycle life (LCA). Then, LCA assesses impact from input And output Which defined For One process or cycle life complete, from acquisiton material standard until disposal end product (Santos et al., 2019).

PT Pertamina Patra Surabaya Integrated Terminal Business has do LCA study in scope Crade to Grave on 2022. Input from previous LCA studies is product made from burn fossil with impact Which dominant in the form of global warming (GWM 100a) with hotspot that is on process distribution. On study previously, not yet done LCA study of product biofuel, so that Not yet Can do comparison product material burn fossil with biofuel . For determine impact environment the biggest And unit hotspot after use product biofuel in aspect emission air, LCA analysis was performed in study This.

2. METHOD

For to obtain description Which systematic about phases research , engineering study must developed. Research This consists of from identification / inventory source scope 1, 2 and 3 emissions in the distribution process biofuel with use method Evaluation Cycle Life Cycle Assessment (LCA), research This see impact environment main from emission air Which produced during process distribution biofuel, with focus on train Rail Tank Wagoon / RTW), pipe, truck tank, and boat tanker as fashion transportation. Purpose main from study This is For identify impact environment the biggest Which happen as well as area in where impact the concentrated, analyzing effectiveness program substitution material burn fossil to biofuel Which done at PT Pertamina Patra Surabaya Integrated Terminal Business, and can determine recommendation repair Which done in effort increase effectiveness program reduction Emissions. Analysis risk can compare LCIA results with detect trend And change in impact environment Which produced from distribution biofuel. Analysis risk become Step important in study This For ensure that strategy subtraction impact environment Which proposed based on on data Which accurate And comprehensive.

Determination location

Study This carried out at PT Pertamina Patra Niaga Integrated Terminal Surabaya where is Wrong One terminal For Supply & Distribution (S&D) operations of PT Pertamina Patra Jatimbalinus Regional Trade And serve distribution material burn in region marketing Java East And surrounding area.

Location and Time of Research
Execution time study This is from month August 2023 – August 2024.

Initial Data Collection

Collection data For studies Life Cycle Assessment (LCA) in context distribution biofuel need approach holistic Which covers all over stage cycle live , start from production until distribution in period time August 2023 to August 2024. Data that required covers emission gas House glass And conventional (CO_2 , CH_4 , N_2O, NOx, SOx , PM and VOC),

consumption energy, as well as various impact environment other in throughout chain distribution. In addition that, data about material standard, process production, and logistics distribution biofuel Also become part important. Purpose from this LCA analysis is For identify dot, dot, dot critical Which potential give impact environment Which big in process distribution. With gather data Which Details And comprehensive from every stage distribution, LCA results are expected capable give description accurate about impact environment in a way overall.

Besides analysis environment , collection data Also covers evaluation risk use HIRARC method (Hazard Identification, Risk Assessment, and Risk Control) as well as aspect technical with implementation Vehicle Routing Problem (VRP). Related data risk collected through identification potential danger in process distribution biofuel, assessment risk Which appear, and implementation action prevention. From side technical, collection data directed For optimize route distribution using VRP to press cost operational, time shipping , and use energy. Collaboration between LCA, HIRARC, and VRP aims For produce solution distribution biofuel Which friendly environment , safe, and efficient in a way technical.

Aspect Environment

Determining Goals and Scope

Determination goal and scope are stage First data processing with method Life Cycle Assessment. Determination goal or objective in accordance with objective from research, namely identify the impact caused from the distribution process biofuel at PT Pertamina Patra Niaga – Integrated Terminal Surabaya for can determined alternative repair from impact said. While determination scope or room scope aiming For know limitation research. Scope or room scope covering system boundaries, product system, and functional units.

a) System boundaries, which are room scope research, namely gate to gate for all over stages of the fuel distribution process which include receipt, storage and distribution of fuel, without to study utilities and activities office . In Figure 2.1, the determination scope This Because activity The main thing in Integrated Terminal Surabaya is distribution of fuel to customers , so that it becomes core module is from start fuel oil receipt, storage process, to distribution to customers at the point distribution backloading and manifold filling shed, using truck tank to the gas station.

b) Functional unit or function unit For set unit the product being studied. In the study This, the functional unit is set at 1 kL based on Design Regulation Director Director General (Perdirjen) LCA – Distribution Sector Oil and Gas. Potential the impacts generated at the LCIA stage are defined later For distribution of 1 kL of fuel.

c) Product system regarding all over channel from the fuel distribution process which includes product input/output, energy, materials fuel, emissions and waste. The process diagram of fuel distribution at Integrated Terminal Surabaya can be seen in Figure 3.3.

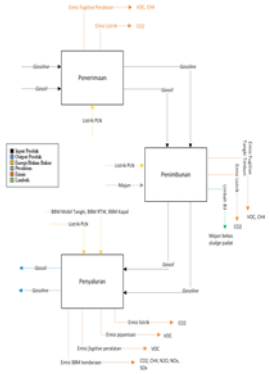

Figure 2.1 Fuel Distribution Process Diagram at the Surabaya Integrated Terminal

Besides That, the scope process is also necessary limited year data study from the analyzed fuel distribution process, namely data from August 2023 to August 2024. For data processing, used SimaPro software with CML-IA (Baseline) method for analysis potential impact.

Interpretation of LCA Results

Interpretation the results of LCA are Stage Where it is done evaluation and determination point hotspot. Determination point hotspot done until stage characterization, with to study each category impact that occurs and hotspot units (contribution largest) for each category impact. The result of stage This will made into as base For taking Conclusion and Recommendations repair. There are 3 stages carried out moment to do LCA data evaluation is completeness check, sensitivity check, and consistency check. Third stage This done based on ISO 14044:2017. Completeness check is performed with inspect data completeness and suitability study with purpose and scope. Sensitivity check is performed with compare results after affected by data changes. Consistency check is performed with do verification data consistency, assumptions, methods, and data processing. Highlighted subjects in do consistency check includes data sources, data accuracy, data age, coverage technology, coverage time, methods used, and coverage geographical.

Analysis Effectiveness Reduction Air Emissions

PT Pertamina Patra Surabaya Integrated Terminal Business is location implementation program subtraction emission air. However, the effectiveness steps subtraction pollution air Which has applied in reduce damage environment Which caused by Still need proven. By Because that's important For compare findings study about biofuel And product material burn fossil For do analysis subtraction impact. Effectiveness program substitution material burn This currently checked so that company can Keep going increase his efforts For reduce pollution air. Findings analysis effectiveness Also can used as data addition For help formulate suggestion repair.

3. RESULT AND DISCUSSION

Aspect Environment

Life cycle inventory (LCI) in research This done with inventorying input and output data in the distribution process biofuel at PT Pertamina Patra Niaga Regional Jatimbalinus – Integrated Terminal Surabaya based on room scope that has been determined, namely gate to gate. Scope gate to gate covers stage reception biofuel at Integrated Terminal Surabaya, stockpiling biofuel in the tank stockpiling and distribution biofuel use a number of fashion transportation. Data collection was carried out in a way quantitative based on calculation and measurement in a way directly at the Integrated Terminal Surabaya from month August 2023 – August 2024. Input and output data include the entire distribution process biofuel in scope studies, including the number of product biofuels received, stockpiled, distributed, and need energy, emissions, and waste generated. Furthermore, the data at the stage life cycle inventory will processed use SimaPro 9.0 software. Biofuel data received (input) and distributed (output) at the Integrated Terminal Surabaya for 1 year can seen in Table 3.1 and the mass balance of the fuel distribution process at the Integrated Terminal Surabaya can seen in Figure 3.1.

Table 3.1 Summary Distribution Process Inventory Biofuel.

Input/Output	Amount	Unit	Amount per Function Unit	Unit	%
Input : Raw Materials					
Gasoline	151,502.58	kL	0.073	kL / kL	7.3
Gasoil	1,257,908.57	kL	0.603	kL / kL	60.3
FAME	677,335.38	kL	0.325	kL / kL	32.5
Ethanol	132.99	kL	0.001	kL / kL	0.1
Input : Energy					
Electricity	1,319,631.41	kWh	0.632	kWh/ kL	
Tanker Car	5,742.10	kWh	0.0028	kL / kL	
Ship Fuel	212,361.20	kWh	0.102	kL / kL	
BBM RTW	259,179.64	kWh	0.124	kL / kL	
Output : Raw Materials					
Gasoline	151,635.57	kL	0.073	kL / kL	7.3
Gasoil	1,935,243.96	kL	0.927	kL / kL	92.7
Output : **Emission into the Air**					
CO2	1,200.02	Ton	0.000575	Ton/ kL	
VOC	36.52	Ton	0.00001750	Ton/ kL	
CH4	3.14	Ton	0.000001507	Ton/ kL	
N2O	0.000421	Ton	0.00000000020	Ton/ kL	
Nox	10.45	Ton	0.00000501	Ton/ kL	
SO2	0.57	Ton	0.0000002754	Ton/ kL	
Output **: B3 waste**					
Sludge **Congested**	31.83	Ton	0.000015	Ton/ kL	
Second Hand Majun	0.10	Ton	0.000000048	Ton/ kL	

Study This discuss aspect environment from distribution biofuel products such as Pertamax Green and Biosolar with use Life Cycle Assessment (LCA) approach. Study show that even though biofuels have potential reduce greenhouse gas emissions glass compared to material burn fossils, their distribution process still produce impact environment in the form of CO2, CH4 emissions and pollution air others that contribute to global warming. For reduce impact this , recommendation including Implementation of Vapor Recovery Unit (VRU) in fuel terminal burn, optimize route delivery using Vehicle Routing Problem (VRP), and strengthening regulation related to LCA. This effort expected support sustainability energy and reduce impact negative industry energy to environment.

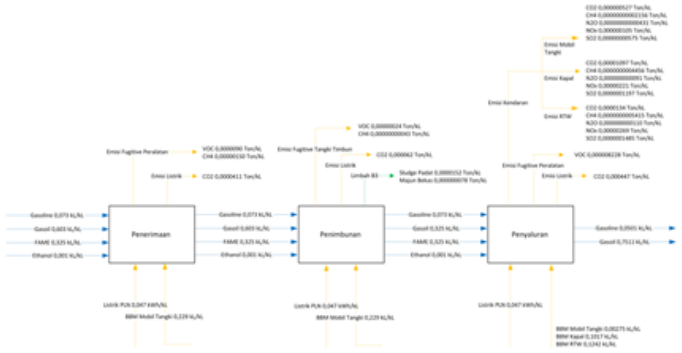

Figure 3.1 Mass Balance of The Fuel Distribution Process at the Integrated Terminal Surabaya

Aspect Risk

In context globalization Which the more complex , challenge related change climate And damage environment become very urgent. Wrong One issue important is use energy Which No friendly environment, such as material burn fossils, which contribute on emission gas House glass (GHG) and pollution air . House gas glass like CO_2 and CH_4, which produced by activity human, have potential For trigger warmup global. When second gas This mixed, they produces CO_2e, size Which accepted in a way international For evaluate impact gas House glass to environment. Three source main pollution air from activity man is waste , industry, and transportation. Emissions from sector energy estimated will Keep going increased, reaching 1,450 million ton on 2060 based on scenario from Pertamina Energy Institute.

Distribution biofuels , such as Pertamax Green and Biosolar, has potential impact risk environment consequence emission air, B3 waste, and emission fugitive during process distribution. Based on Life Cycle Assessment (LCA) study, distribution biofuel produce emission gas House glass (GHG) and waste from various fashion transportation like boat tanker, car tank, up to piping. Research This aiming For analyze risk main distribution biofuel at Integrated Terminal Surabaya - PT Pertamina Patra Commerce , as well as evaluate effectiveness strategy mitigation.

Process distribution biofuel involving three risk Main : (1) Emissions gas House glass (CO_2, CH_4, N_2O) which originate from transportation And evaporation ; (2) Emission fugitive, especially compound organic volatile (VOC) due to leakage on tank storage or moment transfer material burn ; (3) B3 waste, such as oil used And residue tank Which can pollute environment If No managed with good . Besides that, existence facility control emission like Vapor Recovery Unit (VRU) still limited.

In context mitigation risk, options Which under consideration must based on on scenario specific Which has tested previously. For example, if scenario show potential leakage during process distribution , options mitigation like use technology vapor recovery or repair infrastructure distribution can proposed. Every option must compared to with alternative other through analysis cost-benefit And impact environment For determine where Which most effective. Results analysis show that option mitigation Which proposed No only reduce impact negative but Also more efficient in matter cost compared to with option other Which available . By Because that, decision For apply option certain must based on on proof empirical And analysis comprehensive Which show its effectiveness in reduce risk.

For reduce impact environment, it is recommended a number of action mitigation, including VRU optimization for control VOC emissions, maintenance periodic on fashion transportation For minimize leaks, and implementation system monitoring B3 based waste digital. Integration fashion transportation Which more friendly environment, such as piping, too need optimized For efficiency energy.

Distribution biofuel own risk environment Which significant, especially related emission air And management waste. Research This show that strategy mitigation based on technologies, such as VRUs, as well repair management operational, can reduce risk in a way effective. Results This can used as guide For increase sustainability distribution biofuel in Indonesia.

Table 3.2. Risk Assessment

Type Risk	Probability	Severity	Risk Value	Classification	Mitigation
GHG emissions	2 (Unlikely)	4 (Major)	8	Serious	Optimization fashion transportation using VRP
Emissions (VOC)	3 (Possible)	3 (Moderate)	9	Serious	installation and inspection regular leaks
emergence B3 waste	4 (Likely)	2 (Minor)	8	Serious	monitoring and recycling repeat residue
Pollution Environment	3 (Possible)	4 (Major)	12	Serious	Routine fuel tank inspection
Fatality	3 (Possible)	5 (Fatal)	1 55	Critical	Installation Fatigue Control

Study show that fashion distribution, such as car tank And boat tanker, more prone to produce emission compared to piping . Risk the biggest originate from emission fugitive Which often escape from control. Implementation mitigation based on technologies, such as VRUs, can press emission up to 90%. Although Thus , the implementation piping Still need cost tall And commitment cross sector. Recommendations This can help PT Pertamina Patra Commerce reduce footsteps carbon distribution biofuel And support policy energy renewable Indonesia.

In general overall, approach systematic in evaluation risk And election option mitigation very important For ensure sustainability in distribution biofuel. With use Life Cycle Assessment (LCA) method, research This No only evaluate impact environment from biofuel but Also give recommendation strategic For reduce risk in a way overall. thing This covers development policy Which support innovation technology as well as improvement awareness will importance mitigation risk in circles stakeholders interests. With Thus, research This contribute on effort global For create system energy Which more sustainable And friendly environment

Technical Aspects

Vehicle Routing Problem (VRP) is problem optimization Which often faced in distribution goods , including distribution material burn oil (BBM). In context distribution biofuel from Tanjung Fuel Terminal Silver to various gas stations, VRP can used For determine route Which most efficient for fleet shipping. With location terminal and gas stations that has determined, analysis This aiming For minimize distance travel And consumption material burn, and ensure that capacity car tank No exceeded.

	SPBU Code	City	geometry	demand
0	0	Fuel Terminal Tanjung Perak	POINT (691372.859 9202407.751)	0
1	5468403	BANYUWANGI	POINT (867161.434 9085249.897)	8000
2	5463415	PONOROGO	POINT (545746.725 9112611.805)	6933
3	5463404	PONOROGO	POINT (553000.494 9133309.974)	19200
4	5468122	JEMBER	POINT (803427.853 9093834.83)	17067
5	5466217	TULUNGAGUNG	POINT (595271.269 9098057.406)	8000
6	5467305	LUMAJANG	POINT (746385.958 9099186.925)	27467
7	5465184	MALANG	POINT (664985.108 9084049.737)	13867
8	5464152	KEDIRI	POINT (626903.074 9131823.87)	14000
9	5465182	MALANG	POINT (689497.459 9116887.887)	5333
10	5465142	MALANG	POINT (679002.772 9095101.772)	6667
11	5464153	KEDIRI	POINT (610319.574 9138444.596)	21467
12	5462109	BOJONEGORO	POINT (594755.787 9200502.912)	4000
13	5469302	MADURA	POINT (773778.096 9205537.941)	16000
14	5465335	MALANG	POINT (667425.028 9129994.809)	5067
15	5465123	MALANG	POINT (679043.254 9119709.331)	13867
16	5465133	KODYA MALANG	POINT (679291.398 9111954.14)	7733
17	5468104	JEMBER	POINT (795275.237 9094983.483)	13333
18	5462317	TUBAN	POINT (619436.725 9237227.684)	9600
19	5467301	LUMAJANG	POINT (744334.666 9103585.918)	22133
20	5469208	SAMPANG	POINT (747211.621 9210680.431)	7733

Figure 3.2. Gas Station Location Points and Fuel Demand

In analyze distribution material burn use approach Vehicle Routing Problem (VRP), data Which used covering location point delivery And center distribution. Fuel Terminal Cape Silver act as distribution center, while the gas station become objective distribution covers eight point Which has determined. In addition

that, capacity vehicle carrier biofuel, which average is 32 kiloliters, and consumption material burn as much as 90 liters per journey Also become data important. Distance between point counted use formula Haversine For produce mark distance geographical in kilometers.

In scenario This is Tanjung Fuel Terminal Silver functioning as center distribution with coordinates (-7.2123973898643365, 112.73318683504104). From terminal this, biofuel will distributed to some gas stations that own location different, namely Rest Area 695A gas station, Rest Area 678B gas station, 54.61406 gas station, 51.61425 gas station, 55.61340 gas station, 54.61335 gas station, 54.61301 gas station, and 54.61304 gas station. Each gas station has coordinate Which different And need calculation distance Which appropriate For determine route delivery Which optimal .

For complete this VRP with Python, we Can use library such as Google OR-Tools, which provide algorithm For finish problem route vehicle in a way efficient. With enter data location terminal and gas stations as well capacity car tank Which average 32 kL And fuel consumption of 90 liters per journey, we can count amount journey Which required For fulfil request every gas station without exceed capacity vehicle.

Figure 3.3. Alternative Route of VRP Analysis for Banyuwangi, Jember, Lumajang City

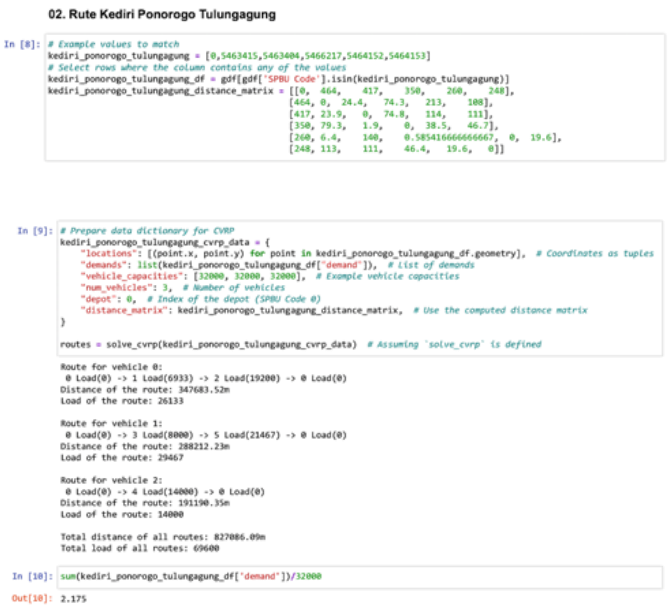

Figure 3.4. Alternative Route of VRP Analysis for Kediri, Ponorogo, Tulungagung City

Figure 3.5. Alternative Route of VRP Analysis for Malang City

Criteria main in analyzing VRP is efficiency distance travel, optimization use vehicles , and utilization capacity maximum vehicle without exceed limit Which set. In addition that, efficiency time distribution, if data Supporter available, too become Wrong One factor evaluation. Distribution Which optimal must fulfil need every gas station with route most short And amount vehicle most little. Thing This aiming For ensure effectiveness

operational And reduce waste source Power.

Indicator VRP success includes distance travel total Which most minimum, usage amount vehicle Which most a little bit, and fulfillment gas station needs without There is excess capacity. In addition that , the cost operational can made into measure measure, in where consumption material burn become Wrong One component mainly. Distribution Which ideal produce route optimal Which in a way significant reduce time And distance travel, so that impact on savings cost material burn And source Power other.

After arrange data beginning And define parameter like distance between point And capacity vehicle, steps furthermore is implement VRP algorithm using Python. We will define function For count distance between dot, dot, dot use formula Haversine For get distance Which accurate based on coordinate geography. Then, with use algorithm optimization from Google OR-Tools, we can find solution route best Which minimize total distance travel .

Analysis done with map problem in form matrix distance Which show connection between point distribution. The VRP model then built use algorithm like Path Cheapest Arc, which designed For produce route distribution most efficient . Results simulation analyzed based on criteria efficiency distance, capacity vehicles, and total cost operational. If results beginning No optimal, iteration done with adapt parameter model or try algorithm alternative.

A number of scenario simulation can implemented For evaluate distribution material burn. Scenario base covers delivery to all gas stations with One vehicle Which do journey repeat. Scenario other involving use a number of vehicle For compare efficiency time And distance . Variation consumption material burn, like improvement to 100 liters per travel, too can modeled For understand the impact to cost. Scenario addition covers evaluation capacity vehicle Which different For identify configuration Which most efficient.

Results from analysis This No only give route delivery Which optimal but Also can help in planning logistics in a way overall . With utilise technology And method analysis data like VRP in fuel distribution, company can increase efficiency operational And reduce cost transportation. This very important in industry energy in where margin profit Can thin And efficiency very required For still competitive in Market. Route Which obtained from analysis This VRP data will done LCA review again For analyze study impact from route alternative from VRP study

4. CONCLUSION

Study This aiming For analyze impact environment from distribution biofuel like Pertamax Green and Biodiesel use Life Cycle Assessment (LCA) approach. In context transition from material burn fossil to biofuel, study This identify that although biofuel considered friendly environment Because reduce emission gas House glass (GHG), process its distribution Still produce emission And waste potential damage environment. Through LCA method, research evaluate various fashion distribution like Rail Tank Wagon, car tank, ship tanker, and pipe For determine strategy subtraction impact environment Which optimal.

Study this also completes problem route fuel delivery from Pertamina to all over gas station point. Researchers capable produce route

shortest through use method Capacitated Vehicle Routing Problem (CVRP). The resulting route is the optimal route that can be passed by Tanker Truck inside fuel delivery from Pertamina to gas station points.

Results study expected give outlook about comparison impact distribution biofuel with material burn fossils, including measurement emission on aspect like warmup global (Global Warming Potential) and damage ecosystem (Ecotoxicity). With Thus , recommendations can arranged For fashion distribution Which more efficient as well as support policy government in promote energy renewable Which sustainable. Research This Also potential contribute on strategy management chain supply biofuel Which more friendly environment And economical energy.

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