

Modelling for Business

OPTIMIZING AND FORECASTING THE AMOUNT OF BIODIESEL STOCK DISTRIBUTION AVAILABILITY IN INDONESIA (FOR PERIOD 2023-2035): A DYNAMIC SYSTEMS APPROACH

TABLE OF CONTENTS

01

**BACKGROUND, DEFINE
THE PROBLEM, AND DATA
INPUT**

02

**DECLARE THE RESEARCH
QUESTION**

03

**DEFINE THE PURPOSE OF THE
MODEL**

04

**DEFINE THE MODEL
BOUNDARY AND IDENTIFY
KEY VARIABLES**

05

**DESCRIBE THE
BEHAVIOR OR DRAW
THE REFERENCE
MODES OF THE KEY
VARIABLES**

06

**DIAGRAM THE BASIC
MECHANISMS, THE
CAUSAL LOOP DIAGRAM,
OF THE SYSTEM**

07

**CONVERT CAUSAL LOOP
DIAGRAM (CLD) TO STOCK
AND FLOW (SFD)**

08

**DEFINE EQUATIONS FOR
EACH VARIABLE**

09

**VERIFYING, VALIDATING, FORECASTING
PROJECTION, AND OPTIMIZING THE SIMULATION
MODEL (INCLUDING INTERPRETING THE RESULT)**

10

CONCLUSION AND SUGGESTION

01

**BACKGROUND,
DEFINE THE
PROBLEM, AND
DATA INPUT**

Background

- In Indonesia, biodiesel is predominantly derived from palm oil, a crucial agricultural product in the nation.
 - The Indonesian government actively promotes biodiesel as part of its efforts to advance clean energy, strengthen energy security, and boost rural economic growth.
 - The main objective is to decrease reliance on fossil fuels and reduce environmental pollution by adopting more sustainable energy sources.
-



The Problem



The availability of biodiesel stock in Indonesia faces several problems, especially with increasing demand both domestically and for global export. Here are some examples of problems that may arise such as the following:

- **Limited Production:** Although Indonesia is one of the main producers of biodiesel, production capacity is often not enough to meet increasing demand. Factors such as bad weather, pest attacks, or problems in the raw material supply chain can disrupt production.
- **Distribution Infrastructure:** Rising demand requires adequate distribution infrastructure to deliver biodiesel products to consumers, both domestically and internationally. Infrastructure limitations can hinder supply efficiency.
- **Regulation and Policy:** Changing government policies on biodiesel, including export subsidies and tariffs, can create uncertainty in the market, affecting investment and production planning.

Addressing these issues requires collaboration between government, industry, and other stakeholders to ensure a sustainable supply of biodiesel amidst rising demand.

**BIODIESEL
CONSUMPTION
SECTORS IN
INDONESIA PERIOD
(PERIOD 2015 - 2025)**

Data Input

Sector	April 2015	January 2016	January 2020	January 2025
Micro business, fishery, transportation and PSO	15%	20%	30%	30%
Non-PSO transportation	15%	20%	30%	30%
Power plants	25%	30%	30%	30%
Industrial and commercial	15%	20%	30%	30%

Source:

<https://www.indonesiapalmoilfacts.com/prospects-for-indonesian-biodiesel-in-2024-and-beyond/>
<https://www.sciencedirect.com/science/article/pii/S1364032123007694>

Data Input

Biodiesel Supply and Demand in Indonesia (Period 2008 - 2017)

Tabel 1. Permintaan Dan Penawaran Biodiesel Indonesia

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Beginning Stocks	18	15	81	38	40	55	7	57	34	34
Production	630	330	740	1800	2200	2800	3000	1180	2450	2600
Import	0	0	0	0	0	0	0	0	0	0
Exports	610	204	563	1440	1515	1800	1350	343	200	100
Consumption	23	60	220	358	670	1048	1600	860	2250	2400
Ending Stocks	15	81	38	40	55	7	57	34	34	134

Biodiesel Production Capacity in Indonesia (Period 2008 - 2017)

Tabel 2. Kapasitas Produksi Biodiesel Indonesia

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Number of Biorefineries	14	20	22	22	26	26	26	27	28	29
Nameplate Capacity	3138	3528	3936	4281	4881	5670	5670	6750	7286	7628
Capacity Use (%)	20%	9%	19%	42%	45%	49%	53%	17%	34%	34%

Source:

<https://gapki.id/news/2017/09/13/perkembangan-biodiesel-di-indonesia-dan-terbesar-di-asia/>

Data Input

BIODIESEL DOMESTIC DEMAND, PRODUCTION, AND DISTRIBUTION STOCK AVAILABILITY IN INDONESIA (PERIOD 2009 - 2023)

Source:

www.Palmoilmagazine.com
<https://gapki.id>
<https://www.statista.com>

▼	Year	▼	Domestic Biodiesel Demand (Kilo Litre)	▼	Domestic Biodiesel Production (Kilo Litre)	▼	Biodiesel Export to Global (Kilo Litre)	▼	Stock Distribution Availability (Kilo Litre)	▼
1	2009		119000		190000		70000		1000	
2	2010		167400		271250		94091		1580	
3	2011		241240		369219		114823		2915	
4	2012		346536		503926		172634		5622	
5	2013		465150		689148		201016		10705	
6	2014		660010		943828		310128		19744	
7	2015		904014		1384014		391652		35168	
8	2016		1464420		1855519		527628		60621	
9	2017		1876188		2567589		674289		101419	
10	2018		2568664		3447935		936239		165090	
11	2019		3572130		4609661		1246721		261875	
12	2020		5008982		6450783		1742397		404965	
13	2021		6916575		8707327		2254902		609905	
14	2022		9605205		12331325		2940025		892020	
15	2023		14103288		17605572		3814941		1259621	
Total			48018802		61927096		15491486		3832249	

02

**DECLARE THE
RESEARCH
QUESTION**

Research Question Regarding Domestic Biodiesel Demand, Domestic Biodiesel Production, and Stock Distribution Availability

- What are the primary variables to drive biodiesel stock distribution availability in Indonesia?
- How does Indonesia manage biodiesel stock distribution availability levels to make sure that supply stability to meet the demand?
- How could increase biodiesel production with new policy and technology ?
- How does Indonesia balance biodiesel production for domestic use versus export global markets?
- What policies could support better alignment between biodiesel production and demand, ensuring market stability?

03

**DEFINE THE
PURPOSE OF THE
MODEL**

Purpose of The Model

- The main purpose of the model is to find out whether the stock distribution availability in Indonesia will be able to meet the needs of both domestic and global export markets.
- To identify the growth in demand for biodiesel exports to the global market as an influencing factor in the stock distribution availability in Indonesia.
- To analyse the product quality, and affordable price average rate for both industrial and retail as an important variable in increasing increasing domestic demand in Indonesia.
- To analyse the influence of the use of the latest technology average rate as an important variable in increasing domestic biodiesel production in Indonesia.
- To analyse the availability of facilities, and infrastructure development average rate as an important variable in increasing biodiesel distribution to stock in Indonesia.

04

**DEFINE THE MODEL
BOUNDARY AND
IDENTIFY KEY
VARIABLES**

The Model Boundary

Data:

- Industrial Product Quality Average Rate
- Affordable Industrial Price Average Rate
- Retail Product Quality Average Rate
- Affordable Retail Price Average Rate
- Lower Energy Efficiency Average Rate
- Engine Performance and Compatibility Issues Average Rate
- Economic Downturns Average Rate
- Lack of Supporting Infrastructure Average Rate
- Growth of Electric Vehicles Average Rate
- Inconsistent Government Policies Average Rate
- Fluctuating Crude Oil Prices Average Rate
- Domestic Biodiesel Demand

**Domestic
Biodiesel
Demand**

**Domestic
Biodiesel
Production**

**Stock
Distribution
Availability**

Data:

- The Influence of The Use of The Latest Technology Average Rate
- Domestic Biodiesel Production Average Rate
- Caused by Force Majors Average Rate
- By System Error Average Rate
- By Human Error Average Rate
- Domestic Biodiesel Production

Data:

- Infrastructure Development Average Rate
- Availability of Facilities Average Rate
- Low Product Quality Average Rate
- Economic Crises Average Rate
- Unattainable Prices for Customers Average Rate
- Low Resource Availability Average Rate
- Domestic Biodiesel Production to Stock Average Rate
- Domestic Biodiesel Demand for Customers Average Rate
- Biodiesel Export to Global Average Rate
- Biodiesel Export to Global
- Stock Distribution Availability

The Key Variables

Model: Domestic Biodiesel Demand

No	Variable Names
1	Industrial Product Quality Average Rate
2	Affordable Industrial Price Average Rate
3	Industrial Demand Average Rate
4	Retail Product Quality Average Rate
5	Affordable Retail Price Average Rate
6	Retail Demand Average Rate
7	Increasing Domestic Demand
8	Domestic Biodiesel Demand

No	Variable Names
9	Lower Energy Efficiency Average Rate
10	Engine Performance and Compatibility Issues Average Rate
11	Economic Downturns Average Rate
12	Lack of Supporting Infrastructure Average Rate
13	Growth of Electric Vehicles Average Rate
14	Inconsistent Government Policies Average Rate
15	Fluctuating Crude Oil Prices Average Rate
16	Declining Domestic Demand

The Key Variables

Model: Domestic Biodiesel Production

No	Variable Names
1	The Influence of The Use of The Latest Technology Average Rate
2	Domestic Biodiesel Production Average Rate
3	Increasing Domestic Biodiesel Production
4	Domestic Biodiesel Production
5	Caused by Force Majors Average Rate

No	Variable Names
6	By System Error Average Rate
7	By Human Error Average Rate
8	Caused by Error Average Rate
9	Declining Domestic Biodiesel Production

The Key Variables

Model: Stock Distribution Availability

No	Variable Names
1	Infrastructure Development Average Rate
2	Availability of Facilities Average Rate
3	Biodiesel Distribution to Stock
4	Domestic Biodiesel Production to Stock Average Rate
5	Domestic Biodiesel Production to Stock
6	Domestic Biodiesel Demand for Customers Average Rate
7	Domestic Biodiesel Demand for Customers

No	Variable Names
8	Low Product Quality Average Rate
9	Economic Crises Average Rate
10	Unattainable Prices for Customers Average Rate
11	Low Resource Availability Average Rate
12	Biodiesel Distribution to Customers
13	Stock Distribution Availability

The Key Variables

Model: Stock Distribution Availability

Submodel: Biodiesel Export to Global

No

Variable Names

1

Biodiesel Export to Global Average Rate

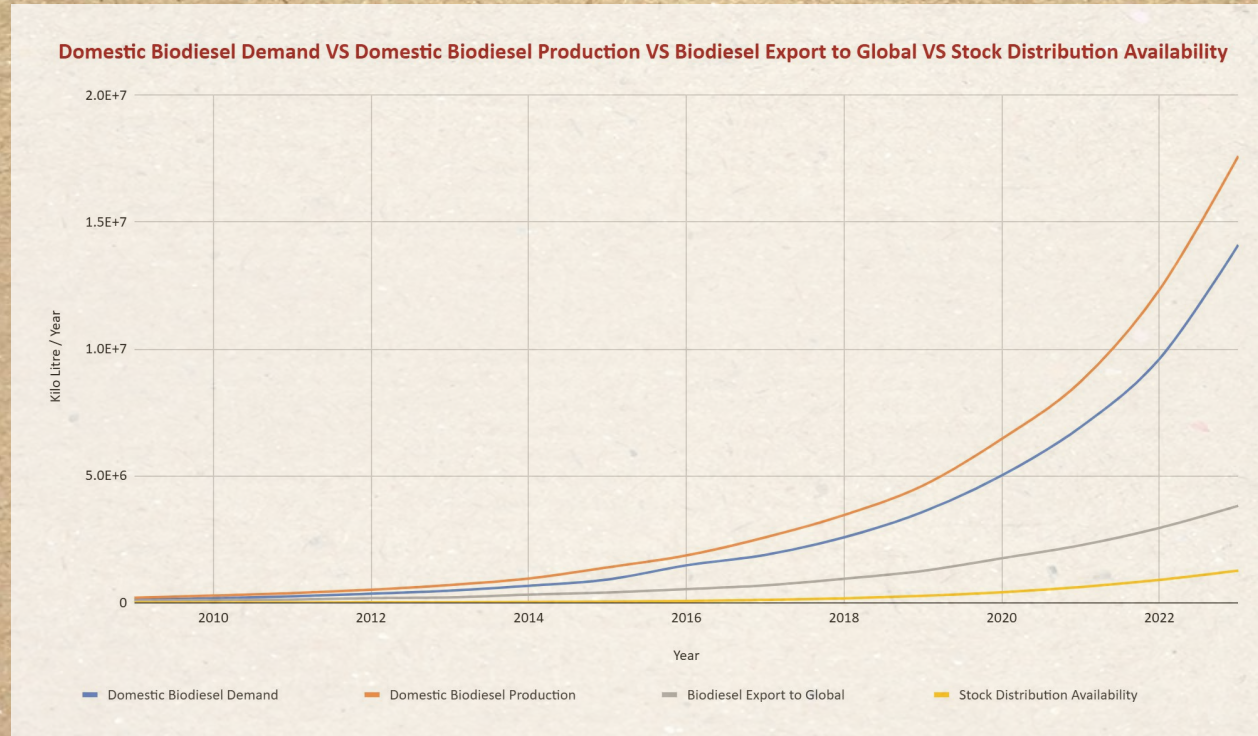
2

Biodiesel Export to Global

05

**DESCRIBE THE
BEHAVIOR OR DRAW
THE REFERENCE
MODES OF THE KEY
VARIABLES**

Draw The Reference Modes of The Key Variables



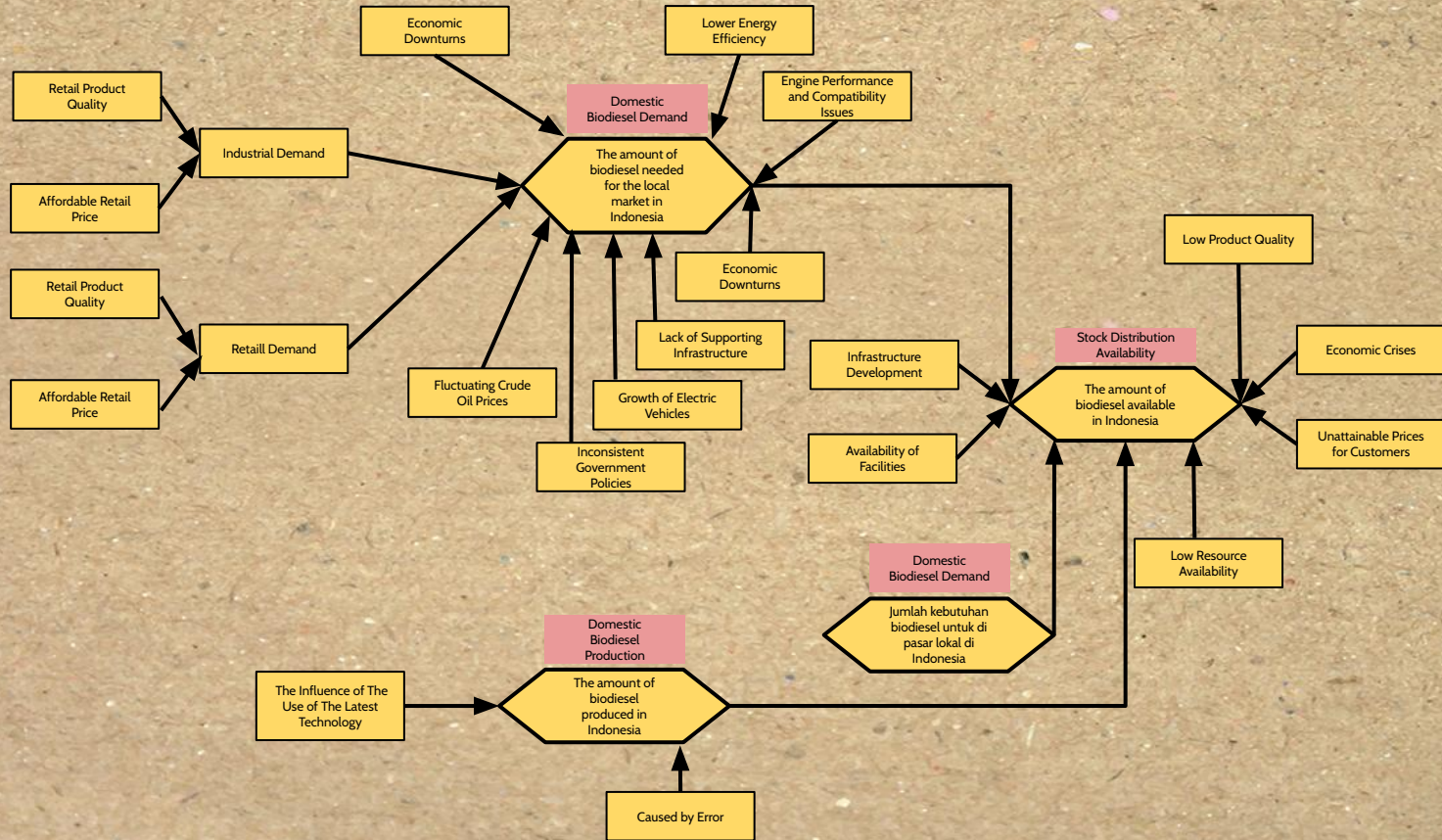
From this graph, we could see that the domestic biodiesel demand variable is increasing significantly, but domestic production variable is growing faster, allowing exports to the global market variable to increase. However, the growth of stock availability for distribution variable seems to be lagging, which could be a problem point for further development of the scale of biodiesel distribution in the future.

Source: Data Processed in 2024

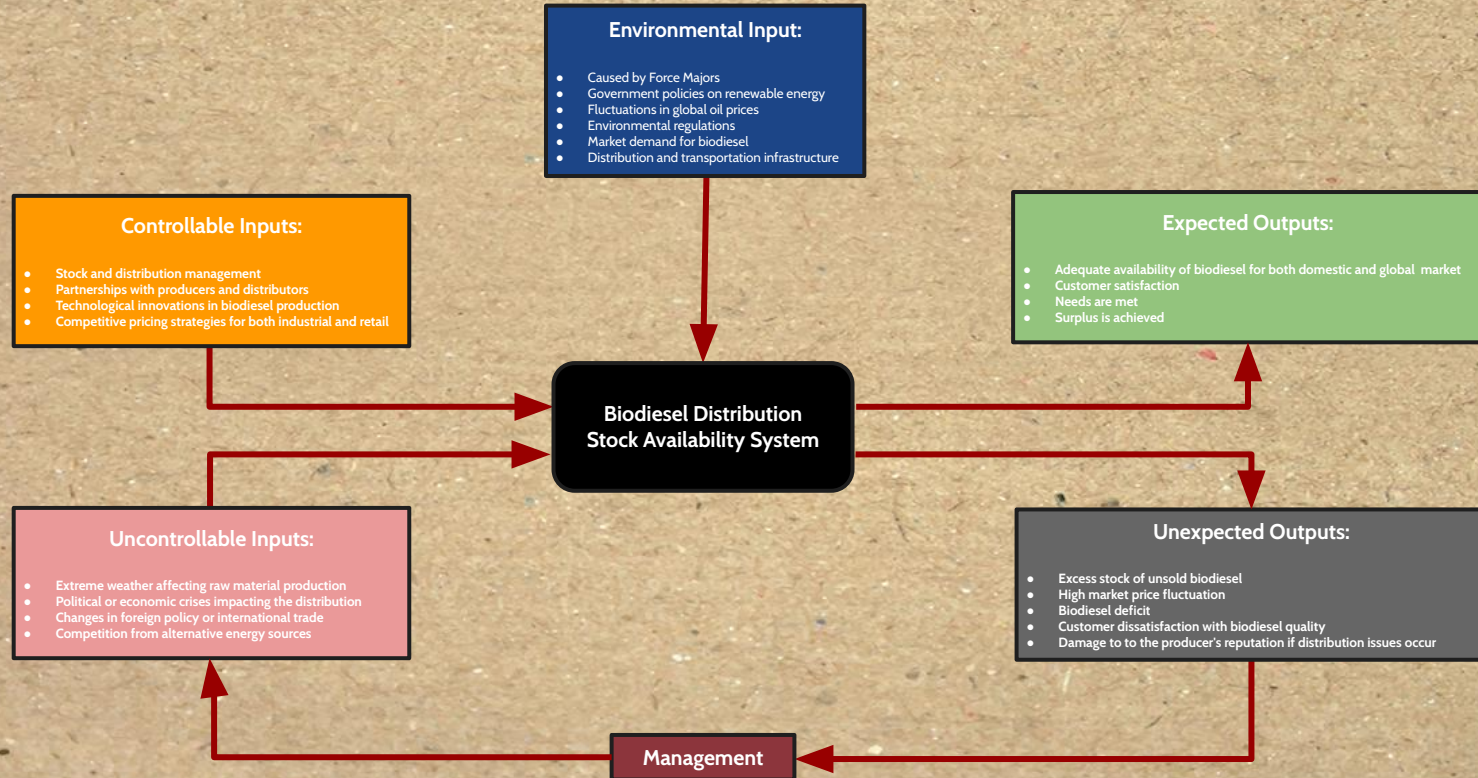
06

**DIAGRAM THE BASIC
MECHANISMS, THE
CAUSAL LOOP
DIAGRAM, OF THE
SYSTEM**

The Influence Diagram

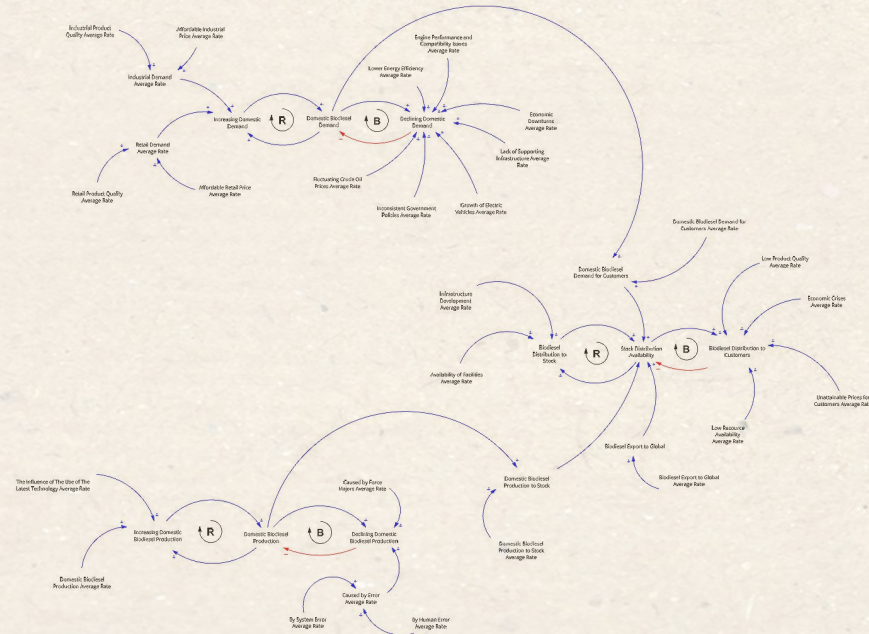


Input-Output Biodiesel Distribution Stock Availability System Diagram



Causal Loop Diagram (CLD)

OPTIMIZING AND FORECASTING THE AMOUNT OF BIODIESEL STOCK DISTRIBUTION AVAILABILITY IN INDONESIA (FOR PERIOD 2023-20235):
A DYNAMIC SYSTEMS APPROACH

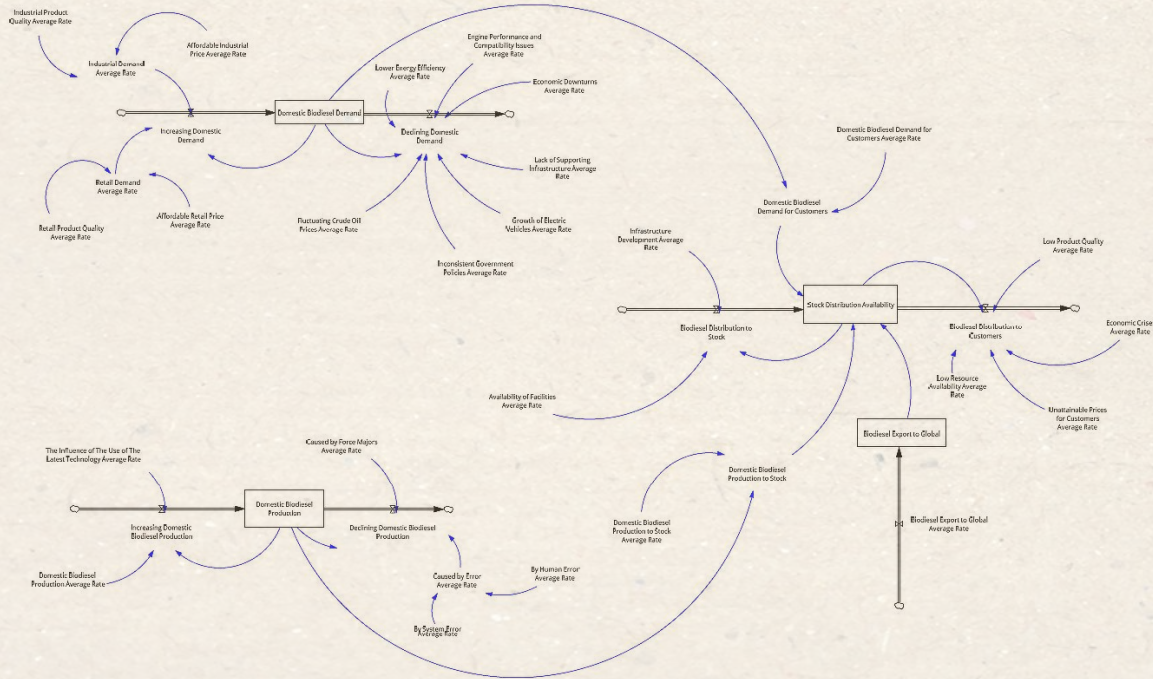


07

**CONVERT CAUSAL
LOOP DIAGRAM
(CLD) TO STOCK AND
FLOW (SFD)**

Stock and Flow Diagram (SFD)

OPTIMIZING AND FORECASTING THE AMOUNT OF BIODIESEL STOCK DISTRIBUTION AVAILABILITY IN INDONESIA (FOR PERIOD 2023-2035): A DYNAMIC SYSTEMS APPROACH



Source: Vensim Software PLE Version 10.2.1

08

**DEFINE EQUATIONS
FOR EACH VARIABLE**

EQUATIONS FOR EACH VARIABLE

No	Variable	Mathematical Equations	Unit
1	Industrial Product Quality Average Rate	0.15	Dmnl
2	Affordable Industrial Price Average Rate	0.05	Dmnl
3	Industrial Demand Average Rate	Affordable Industrial Price Average Rate+Industrial Product Quality Average Rate	Dmnl
4	Retail Product Quality Average Rate	0.05	Dmnl
5	Affordable Retail Price Average Rate	0.15	Dmnl
6	Retail Demand Average Rate	Affordable Retail Price Average Rate+Retail Product Quality Average Rate	Dmnl
7	Increasing Domestic Demand	(Industrial Demand Average Rate+Retail Demand Average Rate)*Domestic Biodiesel Demand	Kilo Litre/Year
8	Domestic Biodiesel Demand	INTEG(Increasing Domestic Demand-Declining Domestic Demand, 14103288	Kilo Litre/Year
9	Lower Energy Efficiency Average Rate	0	Dmnl

EQUATIONS FOR EACH VARIABLE

No	Variable	Mathematical Equations	Unit
10	Engine Performance and Compatibility Issues Average Rate	0	Dmnl
11	Economic Downturns Average Rate	0	Dmnl
12	Lack of Supporting Infrastructure Average Rate	0	Dmnl
13	Growth of Electric Vehicles Average Rate	0	Dmnl
14	Inconsistent Government Policies Average Rate	0	Dmnl
15	Fluctuating Crude Oil Prices Average Rate	0	Dmnl
16	Declining Domestic Demand	(Economic Downturns Average Rate+Engine Performance and Compatibility Issues Average Rate+Fluctuating Crude Oil Prices Average Rate+Growth of Electric Vehicles Average Rate+Inconsistent Government Policies Average Rate+Lack of Supporting Infrastructure Average Rate+Lower Energy Efficiency Average Rate)*Domestic Biodiesel Demand	Kilo Litre/Year
17	The Influence of The Use of The Latest Technology Average Rate	0.13125	Dmnl
18	Domestic Biodiesel Production Average Rate	0.2438	Dmnl

EQUATIONS FOR EACH VARIABLE

No	Variable	Mathematical Equations	Unit
19	Increasing Domestic Biodiesel Production	(Domestic Biodiesel Production Average Rate+The Influence of The Use of The Latest Technology Average Rate)*Domestic Biodiesel Production	Kilo Litre/Year
20	Caused by Force Majors Average Rate	0	Dmnl
21	By Human Error Average Rate	0	Dmnl
22	By System Error Average Rate	0	Dmnl
23	Caused by Error Average Rate	0	Dmnl
24	Declining Domestic Biodiesel Production	(Caused by Error Average Rate+Caused by Force Majors Average Rate)*Domestic Biodiesel Production	Kilo Litre/Year
25	Domestic Biodiesel Production	INTEG(Increasing Domestic Biodiesel Production-Declining Domestic Biodiesel Production, 17605572	Kilo Litre/Year
26	Infrastructure Development Average Rate	0.30	Dmnl
27	Availability of Facilities Average Rate	0.45	Dmnl

EQUATIONS FOR EACH VARIABLE

No	Variable	Mathematical Equations	Unit
28	Biodiesel Distribution to Stock	Stock Distribution Availability*(Availability of Facilities Average Rate+Infrastructure Development Average Rate)	Kilo Litre/Year
29	Domestic Biodiesel Production to Stock Average Rate	0.95	Dmnl
30	Domestic Biodiesel Production to Stock	Domestic Biodiesel Production*Domestic Biodiesel Production to Stock Average Rate	Kilo Litre/Year
31	Domestic Biodiesel Demand for Customers Average Rate	0.93	Dmnl
32	Domestic Biodiesel Demand for Customers	Domestic Biodiesel Demand*Domestic Biodiesel Demand for Customers Average Rate	Kilo Litre/Year
33	Low Product Quality Average Rate	0	Dmnl
34	Economic Crises Average Rate	0	Dmnl
35	Unattainable Prices for Customers Average Rate	0	Dmnl

EQUATIONS FOR EACH VARIABLE

No	Variable	Mathematical Equations	Unit
36	Low Resource Availability Average Rate	0	Dmnl
37	Biodiesel Distribution to Customers	Stock Distribution Availability*(Economic Crises Average Rate+Low Product Quality Average Rate+Low Resource Availability Average Rate+Unattainable Prices for Customers Average Rate)	Kilo Litre/Year
38	Biodiesel Export to Global	INTEG(Biodiesel Export to Global*Biodiesel Export to Global Average Rate, 3814941	Kilo Litre/Year
39	Biodiesel Export to Global Average Rate	0.33	Dmnl
40	Stock Distribution Availability	INTEG(Biodiesel Distribution to Stock-Biodiesel Distribution to Customers+Domestic Biodiesel Production to Stock-Domestic Biodiesel Demand for Customers-Biodiesel Export to Global, 1259621	Kilo Litre/Year

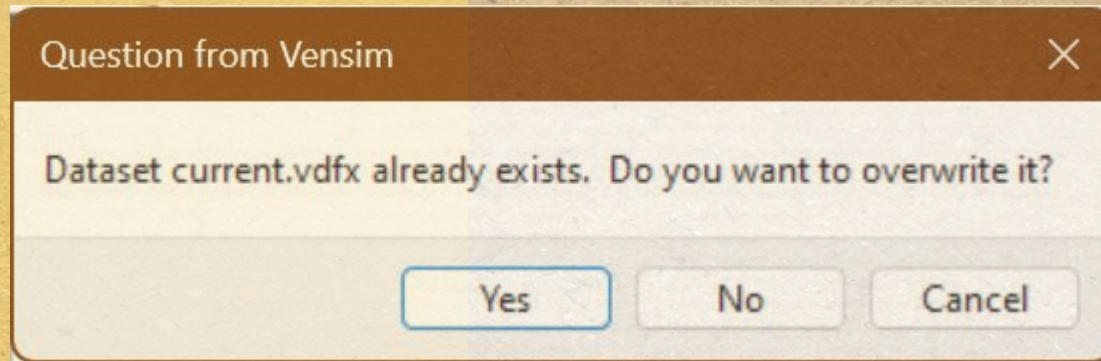
09

**VERIFYING, VALIDATING,
FORECASTING PROJECTION,
AND OPTIMIZING THE
SIMULATION MODEL
(INCLUDING INTERPRETING
THE RESULT)**

Vensim PLE Version 10.2.1

Verifying: The Simulation Model

The model that has been created is then verified to see whether an error occurs or not. If an error occurs in the existing model, then the logic of the simulation created is not completely correct. Models that experience errors must repeat the creation of the initial simulation model. The results of running the model created in 3 model areas and 1 submodel are shown in the image below and it can be seen that the model is free from error. So the model has fulfilled the following verification stages:



Source: Verification of Vensim Model

Validation: Real Data VS Simulation Data

The validity of the simulation is identified by the Root Mean Square Percentage Error (RMSPE), which compares actual historical data and simulation results which are getting smaller RMSPE number, the higher the validity of the simulation data.

$$\text{RMSPE} = \sqrt{\sum_{i=0}^n \frac{(x_s - x_e)^2}{n}} \times 100\%$$

Where:

Xs = Simulation Data

Xe = Existing (Real) Data

n = Period / Amount of Data

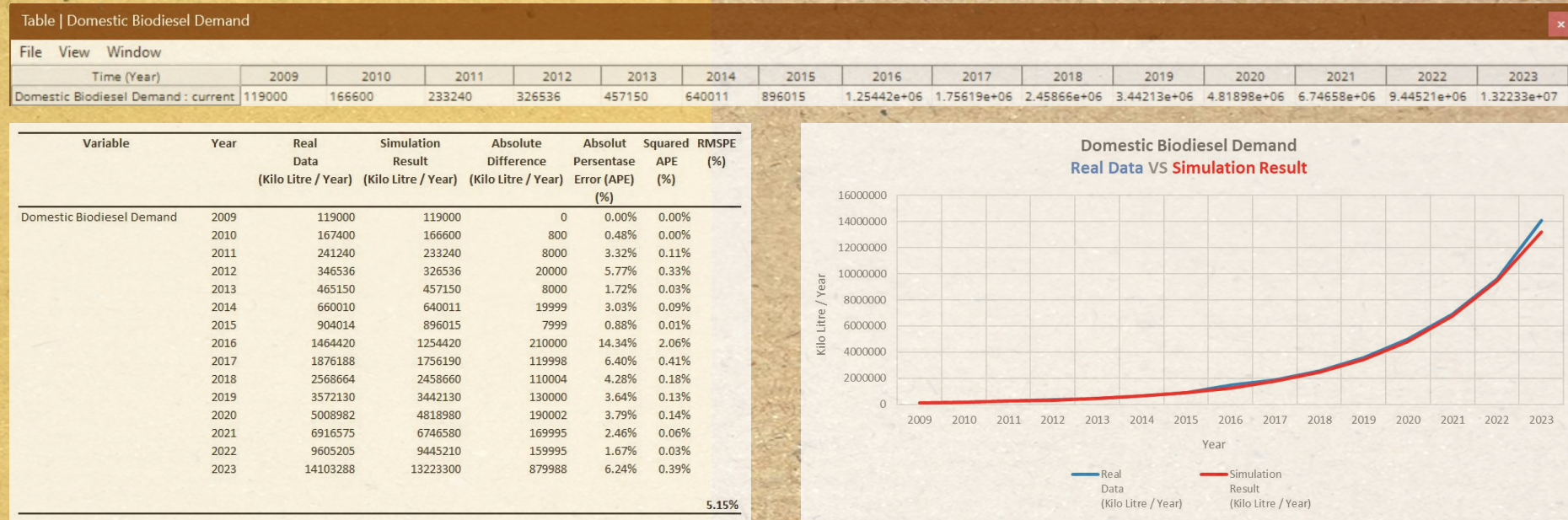
Interpretation of RMSEP values:

- **Error < 5%** = Very valid in describing existing (real) conditions
- **5% < Error < 10%** = Valid in describing existing (real) conditions
- **Error > 10%** = Invalid in describing existing (real) conditions

Validation: Real Data VS Simulation Data

Output Data and Domestic Biodiesel Demand Validation

Simulation Result on Vensim Software:



Due to The $RMSPE = 5\% < 5.15\% < 10\%$, Thus, the Domestic Biodiesel Demand Simulation Results is **valid** in describing existing (real) conditions

Source: Data Processed in 2024

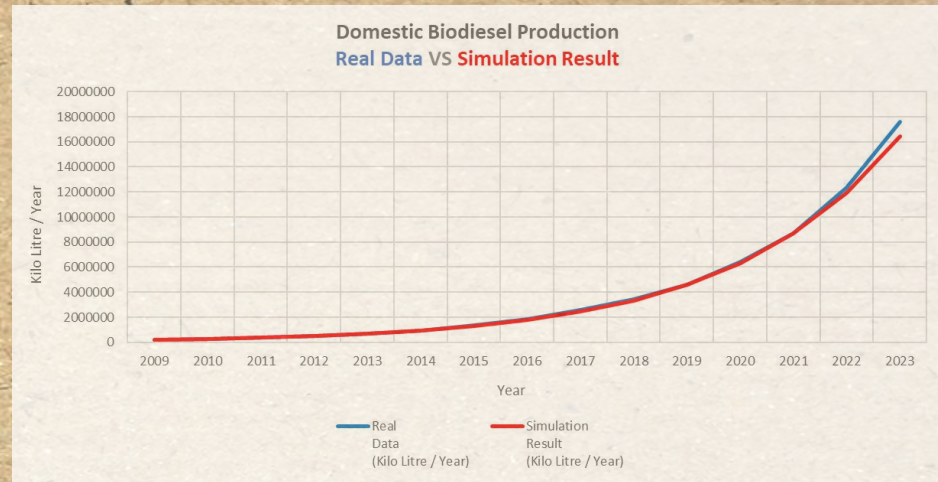
Validation: Real Data VS Simulation Data

Output Data and Domestic Biodiesel Production Validation

Simulation Result on Vensim Software:

Table Domestic Biodiesel Production															
File View Window															
Time (Year)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Domestic Biodiesel Production : current	190000	261260	359245	493980	679247	933998	1.28429e+06	1.76597e+06	2.4283e+06	3.33903e+06	4.59133e+06	6.31331e+06	8.68111e+06	1.1937e+07	1.64139e+07

Variable	Year	Real Data (Kilo Litre / Year)	Simulation Result (Kilo Litre / Year)	Absolute Difference (Kilo Litre / Year)	Absolut Percentase Error (APE) (%)	Squared APE (%)	RMSPE (%)
Domestic Biodiesel Production	2009	190000	190000	0	0.00%	0.00%	3.68%
	2010	271250	261260	9990	3.68%	0.14%	
	2011	369219	359245	9974	2.70%	0.07%	
	2012	503926	493980	9946	1.97%	0.04%	
	2013	689148	679247	9901	1.44%	0.02%	
	2014	943828	933998	9830	1.04%	0.01%	
	2015	1384014	1284290	99724	7.21%	0.52%	
	2016	1855519	1765970	89549	4.83%	0.23%	
	2017	2567589	2428300	139289	5.42%	0.29%	
	2018	3447935	3339030	108905	3.16%	0.10%	
	2019	4609661	4591330	18331	0.40%	0.00%	
	2020	6450783	6313310	137473	2.13%	0.05%	
	2021	8707327	8681110	26217	0.30%	0.00%	
	2022	12331325	11937000	394325	3.20%	0.10%	
	2023	17605572	16413900	1191672	6.77%	0.46%	



Due to The RMSPE = **3.68%**<5%, Thus, the Domestic Biodiesel Production Simulation Results is **very valid** in describing existing (real) conditions.

Source: Data Processed in 2024

Validation: Real Data VS Simulation Data

Output Data and Biodiesel Export to Global Validation

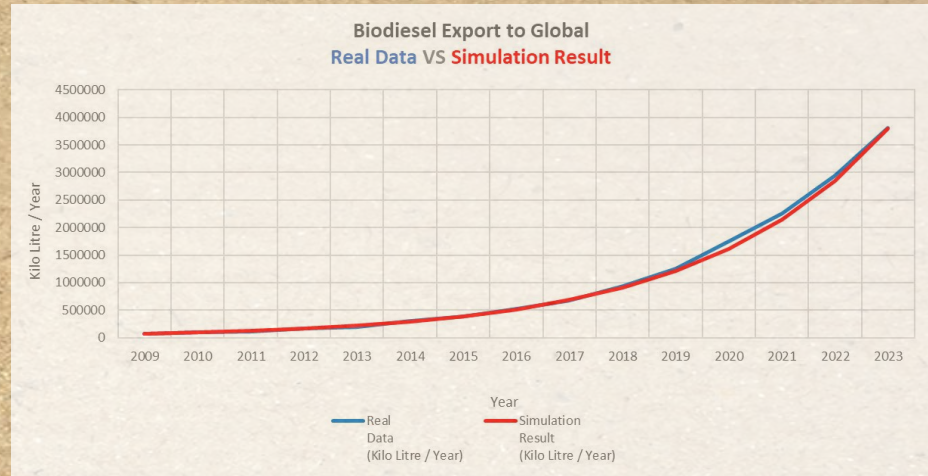
Simulation Result on Vensim Software:

Table | Biodiesel Export to Global

File View Window

Time (Year)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Biodiesel Export to Global : current	70000	93100	123823	164685	219031	291311	387443	515299	685348	911513	1.21231e+06	1.61238e+06	2.14446e+06	2.85213e+06	3.79333e+06

Variable	Year	Real Data (Kilo Litre / Year)	Simulation Result (Kilo Litre / Year)	Absolute Difference (Kilo Litre / Year)	Absolut Persentase Error (APE) (%)	Squared APE (%)	RMSPE (%)
Biodiesel Export to Global	2009	70000	70000	0	0.00%	0.00%	
	2010	94091	93100	991	1.05%	0.01%	
	2011	114823	123823	-9000	-7.84%	0.61%	
	2012	172634	164685	7949	4.60%	0.21%	
	2013	201016	219031	-18015	-8.96%	0.80%	
	2014	310128	291311	18817	6.07%	0.37%	
	2015	391652	387443	4209	1.07%	0.01%	
	2016	527628	515299	12329	2.34%	0.05%	
	2017	674289	685348	-11059	-1.64%	0.03%	
	2018	936239	911513	24726	2.64%	0.07%	
	2019	1246721	1212310	34411	2.76%	0.08%	
	2020	1742397	1612380	130017	7.46%	0.56%	
	2021	2254902	2144460	110442	4.90%	0.24%	
	2022	2940025	2852130	87895	2.99%	0.09%	
	2023	3814941	3793330	21611	0.57%	0.00%	
							4.57%



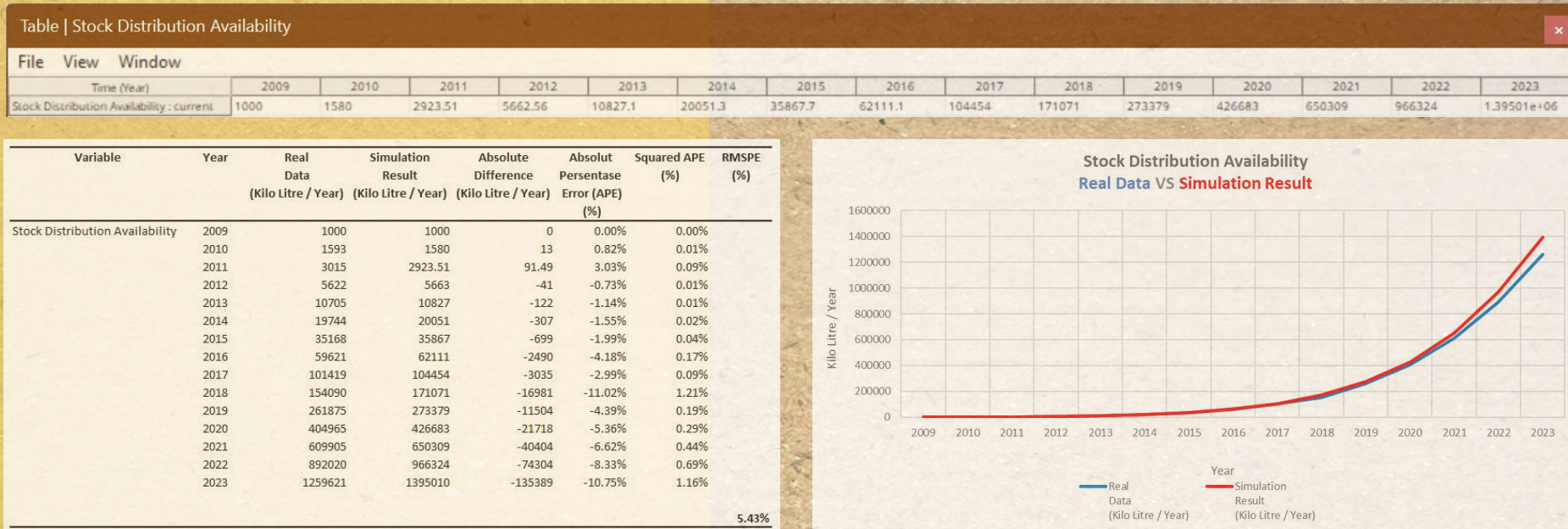
Due to The RMSPE = **4.57%**<5%, Thus, the Domestic Biodiesel Production Simulation Results is **very valid** in describing existing (real) conditions.

Source: Data Processed in 2024

Validation: Real Data VS Simulation Data

Output Data and Stock Distribution Availability Validation

Simulation Result on Vensim Software:



Due to The $RMSPE = 5\% < 5.43\% < 10\%$, Thus, the Domestic Biodiesel Demand Simulation Results is **valid** in describing existing (real) conditions

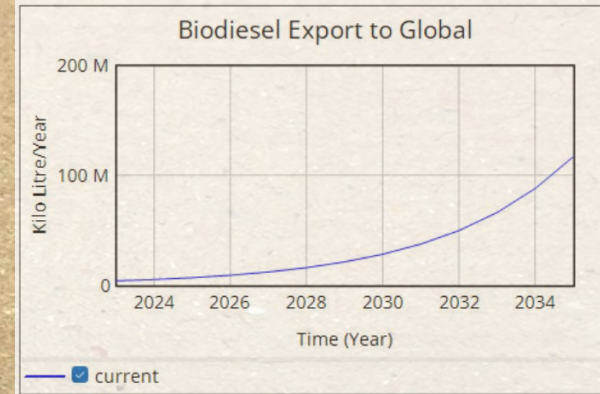
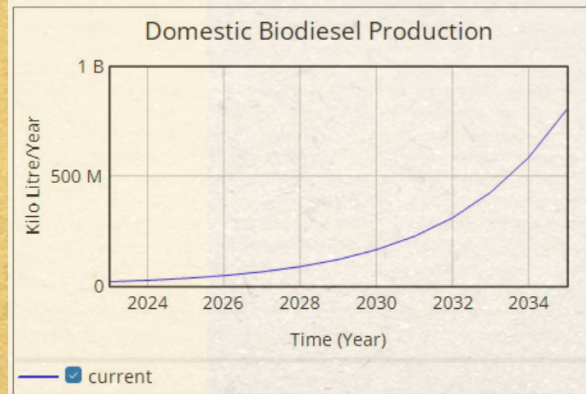
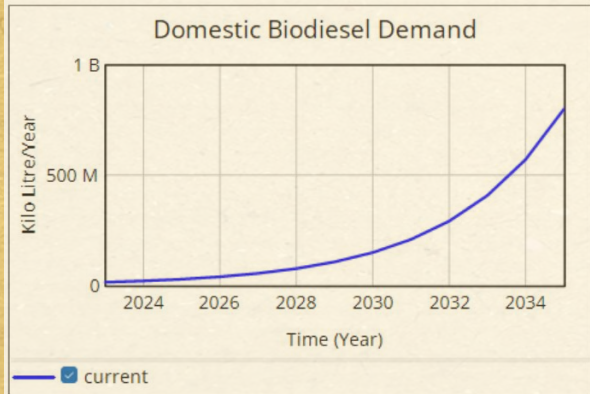
Source: Data Processed in 2024

Forecasting Projection: Without Policy Strategy Intervention For Period 2023-2035

Output Data of Domestic Biodiesel Demand, Domestic Biodiesel Production, Biodiesel Export to Global, and Stock Distribution Availability

Simulation Result on Vensim Software:

Table Selected Variables													
File View Window													
Time (Year)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Biodiesel Export to Global : current	3.81494e+06	5.07387e+06	6.74825e+06	8.97517e+06	1.1937e+07	1.58762e+07	2.11153e+07	2.80834e+07	3.73509e+07	4.96767e+07	6.607e+07	8.78731e+07	1.16871e+08
Domestic Biodiesel Demand : current	1.41033e+07	1.97446e+07	2.76424e+07	3.86994e+07	5.41792e+07	7.58509e+07	1.06191e+08	1.48668e+08	2.08135e+08	2.91389e+08	4.07944e+08	5.71122e+08	7.99571e+08
Domestic Biodiesel Production : current	1.76056e+07	2.42085e+07	3.3288e+07	4.57726e+07	6.29396e+07	8.65451e+07	1.19004e+08	1.63636e+08	2.25008e+08	3.09397e+08	4.25437e+08	5.84997e+08	8.044e+08
Stock Distribution Availability : current	1.25962e+06	1.99863e+06	3.05937e+06	4.52172e+06	6.43135e+06	8.72387e+06	1.10671e+07	1.2548e+07	1.10691e+07	2.21238e+06	-2.28691e+07	-8.13141e+07	-2.05569e+08

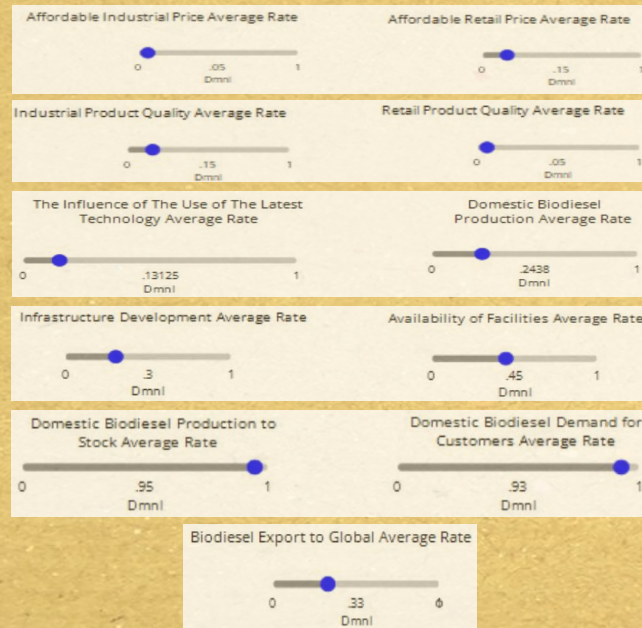


Source: Data Processed in 2024

Forecasting Projection: Without Policy Strategy Intervention For Period 2023-2035

Output Data of Domestic Biodiesel Demand, Domestic Biodiesel Production, Biodiesel Export to Global, and Stock Distribution Availability

Simulation Result on Vensim Software:



The simulation results for the "Stock Distribution Availability" has shown that although initially there was an increase from 2023 to 2032, yet there was a sharp decline from 2033 to 2035 due to the increase in biodiesel domestic & export to global demand far exceeding existing the biodiesel production.

Our Group's Policy Strategies

Therefore, to continue meeting the needs for “Stock Distribution Availability” of biodiesel in Indonesia in the coming years, we have determined the following 3 policy strategy options:



**#1. Increasing
The Biodiesel
Production
Average Rate
Policy Strategy**



**#2. By Declining The
Export to Global Average
Rate (in Order to Fulfil The
Availability in Domestic
Needs First)**

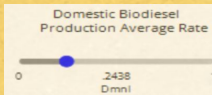


**#3. Combining
The #2 & #3
Strategy Policy**

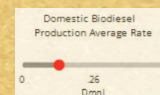
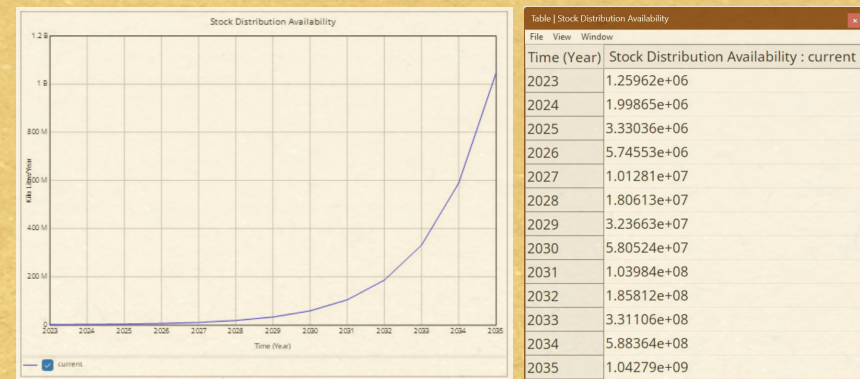
Optimizing The Model (With Policy Strategy Intervention For Period 2023-2035)

#1 Scenario: By Increasing The Domestic Biodiesel Production Average Rate

Before



After



By increasing the "Average Rate of Domestic Biodiesel Production" at minimum 0.012 (1.2%) from 0.248 to 0.26, the results show that the "Availability of Stock Distribution" value increased sharply, especially in 2033 to 2035, different from the previous situation.

Optimizing The Model (With Policy Strategy Intervention For Period 2023-2035)

#2 Scenario: By Declining The Export to Global Average Rate (in Order to Fulfil The Availability in Domestic Needs First)

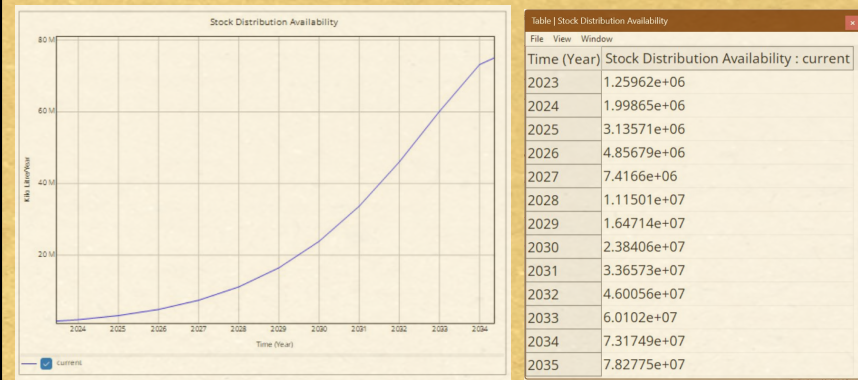
Before



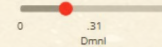
Biodiesel Export to Global Average Rate



After



Biodiesel Export to Global Average Rate



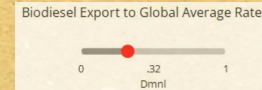
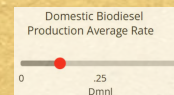
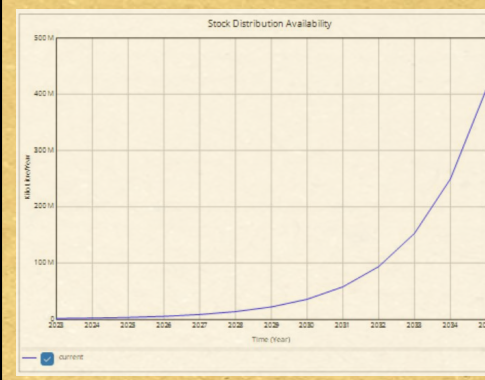
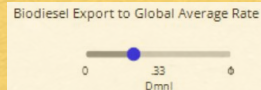
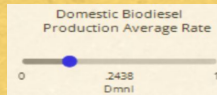
By declining the "Export to Global Average Rate" at minimum 0.02 (2%) from 0.33 to 0.31, the results show that the "Availability of Stock Distribution" value increased sharply, especially in 2033 to 2035, different from the previous situation.

Optimizing The Model (With Policy Strategy Intervention For Period 2023-2035)

#3 Scenario: By Combining The #2 & #3 Strategy Policy

Before

After



By increasing the "Average Rate of Domestic Biodiesel Production" at minimum 0.002 (0.2%) from 0.248 to 0.25 and declining the "Export to Global Average Rate" at minimum 0.01 (1%) from 0.33 to 0.32, the results show that the "Availability of Stock Distribution" value also increased sharply, especially in 2033 to 2035, different from the previous situation.

10

**CONCLUSION
AND
SUGGESTION**

Conclusion

- From the results of simulations carried out without any policy strategy intervention, the variables that influence of “Availability of Stock Distribution” are “Domestic Biodiesel Demand”, “Domestic Biodiesel Production”, and “Biodiesel Export to Global”, where the amount of “Stock Distribution Availability” from 2023-2035 decreases significantly with the average rate 44.68%.
- Based on scenario #1, the policy strategy intervention carried out by increasing the minimum “Domestic Biodiesel Production Average Rate” by only 1.2% (for example, the 2023-2035 period) could increase the “Stock Distribution Availability” which was previously minus from -22859000 KL/Year (2023) , -81296200 KL/Year (2024), and -205537000 KL/Year (2025), to become 331106000 KL/Year (2023), 5.88E+08 KL/Year (2024), and 1042790000 KL/Year (2025). This increase has had a very significant influence on the existing forecast for increasing the “Stock Distribution Availability” of Biodiesel.
- Based on scenario #2, the policy strategy intervention carried out by declining the “Export to Global Average Rate” (in order to fulfil the availability in domestic needs first) by only minimum 2% (for example, the 2023-2035 period) could increase the “Stock Distribution Availability” which was previously minus from -22859000 KL/Year (2023) , -81296200 KL/Year (2024), and -205537000 KL/Year (2025), to become 60102000 KL/Year (2023), 73174900 KL/Year (2024), and 78277500 KL/Year (2025). This increase has had a very significant influence on the existing forecast for increasing the “Stock Distribution Availability” of biodiesel.
- Based on scenario #3, the policy strategy intervention carried out by Combining The #2 & #3 Strategy Policy by increasing the minimum “Domestic Biodiesel Production Average Rate” by only 0.2% and also declining the “Export to Global Average Rate” (in order to fulfil the availability in domestic needs first) by only minimum 1% (for example, the 2023-2035 period) could also increase the “Stock Distribution Availability” which was previously minus from -22859000 KL/Year (2023) , -81296200 KL/Year (2024), and -205537000 KL/Year (2025), to become 152702000 KL/Year (2023), 249336000 KL/Year (2024), and 408263000 KL/Year (2025). This increase has had a very significant influence on the existing forecast for increasing the “Stock Distribution Availability” of biodiesel.
- After running all of the three scenarios above, it could be concluded that the most optimal and efficient scenario for increasing the “Stock Distribution Availability” of biodiesel is scenario #1 without declining our quantity of “biodiesel export to global market”.

Suggestion

- ❖ Based on simulations that have been carried out for the 2023-2035 period, the Indonesian government must be responsive in handling the level of biodiesel demand which increases every year in Indonesia, both in terms of domestic demand and the need for export to the global market.
- ❖ By increasing the Domestic Biodiesel Production Average Rate, the Availability of Stock Distribution of Biodiesel can be fulfilled to meet the needs of both domestic and global markets.
- ❖ The government needs to issue policies to increase the ratio of Domestic Biodiesel Production Average Rate such as the following:
 - **Boost Innovation and Technology:** Focus on developing advanced and more efficient technologies for biodiesel production and application.
 - **Enhance Investment:** Encourage greater financial backing from both public and private sectors to support the growth of the biodiesel industry.
 - **Increase Public Awareness:** Promote education and awareness among the public and industries about the crucial role of biodiesel in ensuring a sustainable energy future.
 - **Strengthen Policy Framework:** Implement clear and consistent policies that will promote and support the biodiesel sector's development.



THANKS

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2024

