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THE EFFECT OF OVER DIMENSION OVERLOAD (ODOL) VEHICLES ON NATIONAL ROAD DAMAGE

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Abstract

The road's condition owing to the vehicle's Over Dimension Over Load (ODOL) is one of several highway issues. To further supervise and conduct road safety against overload as stated in Law No. 22 of 2009 concerning Road Traffic and Transportation article 169 paragraph (1) to (3), it is necessary to research to determine the extent to which Over Dimensions Over Load (ODOL) vehicles affect the life of the road plan on the flexible pavement. This article discusses the Effect Of Over Dimension Overload (Odol) Vehicles On National Road Damage in Kalimantan Barat, specifically on the Jalan Lintas Kalimantan Poros Tengah/Jalan Raya Sosok II Kabupaten Sanggau and as a comparison in selected Jalan Raya Sintang, Kabupaten Sintang. This study examines the impact of Over Dimension Over Load (ODOL) cars on the VDF (Vehicle Damage Factor) and the 2023 ZERO ODOL plan on the pavement plan for the Jalan Lintas Kalimantan Poros Tengah (Jalan Raya Sosok II Kabupaten Sanggau and Jalan Raya Sintang, Kabupaten Sintang), a national route in Kalimantan Barat.

By using primary data (photo documentation of dimension overload vehicles, road conditions) and secondary data (average daily traffic from P2JN, ODOL percentage data from BPTD XIV West Kalimantan, vehicle data at UPPKB Sosok and UPPKB Sintang, the calculation of traffic growth, vehicle overload, vehicle damage factor (VDF) value due to ODOL vehicles, Equivalent Single Axle Load, plan CESA, normal CESA, overload CESA, and remaining life (RL) value).

The investigation shows that Jalan Raya Sosok II Kabupaten Sanggau and Jalan Raya Sintang, Kabupaten Sintang's plant life cannot survive owing to the vehicle's Over Dimension Over Load (ODOL). Jalan Raya Sosok II Kabupaten Sanggau will last 8.04 years and Jalan Raya Sintang, Kabupaten Sintang 8.23 years. Thus, Jalan Raya Sosok II Kabupaten Sanggau 1, 95 years or 19.5%, and Jalan Raya Sintang, Kabupaten Sintang 1, 77 years or 17.7%, have shorter pavement lifespans.

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1. Introduction

Roads play a significant role in daily life as part of the land transportation infrastructure that facilitates commerce, social, and tourist activities that result in the flow of goods and services traffic or as a connecting connection between two regions. One roadway issue is ODOL (Over Dimension Over Load) car damage. Damaged highways cause many losses and are risky for drivers. Excessive dimensions and weights cause damage to roads and bridges and increase the risk of accidents. Loading processes, carrying capacity, dimensions, and road classifications are required by Law No. 22 of 2009 on Traffic and Transportation of Goods.

According to Government Regulation No. 77 of 2014, a driver must lower a load exceeding 5%. The number of community centers in West Kalimantan and the lack of access to road networks that can pass heavy loads lead this route to have a very high volume of ODOL (Over Dimension Over Load) vehicles. Therefore an evaluation of road life reduction must account for vehicle overload.

As stated in Law No. 22 of 2009 concerning Road Traffic and Transportation article 169 paragraphs (1) to (3), the driver and/or Public Transport Company of goods must comply with loading procedures, carrying capacity, vehicle dimensions, and road class to supervise and protect against overloading or over-dimension vehicles. However, many vehicles crossing the road are overloaded because direct handling and supervision in the field of overloaded vehicles still need to be improved. This also occurs on National Roads in West Kalimantan, one of which is on Jalan Lintas Kalimantan Poros Tengah; Jalan Raya Sosok II Kabupaten Sanggau and Jalan Raya Sintang, Kabupaten Sintang.

This research is a comparative study that compares the condition of national roads in Kalimantan Barat, Jalan Raya Sosok II Kabupaten Sanggau and Jalan Lintas Kalimantan Poros Tengah Kabupaten Sintang due to the overload of vehicles crossing it. This research aims to assess the impact of car Over Dimension Over Load (ODOL) on VDF and the ODOL ZERO 2023 plan on the pavement plan for the Jalan Raya Sosok II Kabupaten Sanggau-Jalan Lintas Kalimantan Poros Tengah Kabupaten Sintang.

2. Materials and Methods (Arial 10 Pt)

2.1 Theoretical Frame Work

One of the roadway difficulties is the road's condition due to the vehicle's Over Dimension Over Load (ODOL). To further supervise and conduct road safety against overload, as stated in Law No. 22 of 2009 concerning Road Traffic and Transportation article 169 paragraph (1) to (3), research is required to determine the extent to which Over Dimensions Over Load (ODOL) vehicles affect the life of the road plan on the flexible pavement.

This study investigates the impact of over-dimension overload (Odol) vehicles on national road damage in Kalimantan Barat, focusing on the Jalan Lintas Kalimantan Poros Tengah/Jalan Raya Sosok II Kabupaten Sanggau and comparing it to the chosen Jalan Raya Sintang, Kabupaten Sintang. This study investigates the impact of Over Dimension Over Load (ODOL) cars on the VDF (Vehicle Damage Factor) and the 2023 ZERO ODOL plan on the pavement plan for the Jalan Lintas Kalimantan Poros Tengah (Jalan Raya Sosok II Kabupaten Sanggau and Jalan Raya Sintang, Kabupaten Sintang), a national route in Kalimantan Barat.

2.2 Research Location

The location of this study is on the National Road Section in Kalimantan Barat, precisely on the Sintang Highway or the Central Axis Kalimantan Causeway, Sintang Regency, Kalimantan Barat.

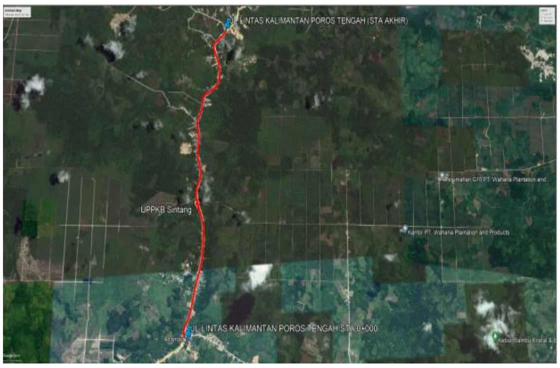

Figure 1. Research Location (*Google Earth,* 2022)

2.3 Data

This study uses primary data; photo documentation of overloaded vehicle dimensions and road conditions, and secondary data; vehicle volume data for 2018-2021 from Kalimantan Barat National Road Planning and Supervision (P2JN), data on vehicles with overload in June 2022 from the Sintang Motor Vehicle Weighing Implementation Unit (UPPKB).

In summary, the course of the research is like the following flowchart,

Figure 2. Research Flow Chart

2.4 Analysis Method

This study includes calculating the growth rate, predicting average daily traffic (LHR) over the life of the plan, calculating the value of damage or vehicle damage factor (VDF) due to ODOL vehicles, calculating the cumulative equivalent standard axis (CESA), and calculating remaining life.

a) ***Calculating the growth rate***

Calculates the growth rate that occurs during the life of the pavement plan by using the formula:

$$R = \frac{(1+0{,}01i)^{UR}-1}{0{,}01\ i} \quad (1)$$

Based on the Pavement Design Manual (2017), traffic growth factors are obtained based on data-series growth data or correlation formulations with other applicable growth factors. Still, if no data is available then the following table can be used (2015-2035).

Table 1. Traffic Growth Rate Factors (*i*) (%)

	Jawa	Sumatera	Kalimantan	Rata - rata Indonesia
Arteri dan Perkotaan	4,80	4,83	5,14	4,75
Kolektor Rural	3,50	3,50	3,50	3,50
Jalan Desa	1,00	1,00	1,00	1,00

(Source: Pavement Design Manual, 2017)

b) ***Predicting LHR (Average Daily Traffic) over the life of the plan:***

$LHR_n = LHR_1 \times (1+i)^n$ (2)

with;

i : Growth Rate
n : n-th year
LHR_1 : LHR initial year
LHRn : LHR n-th year

c) ***Calculating the value of damage or Vehicle damage Factor (VDF) due to ODOL vehicles***:

- ESTRT $\left[\frac{Single\ Axis\ Load\ (tons)}{5{,}3}\right]^4$ (3)
- ESTRG $\left[\frac{Bingle\ Axis\ Load\ (tons)}{8{,}16}\right]^4$ (4)
- ESDRG

  $0{,}086\left[\frac{Single\ Axis\ Load\ (tons)}{8{,}16}\right]^4$ (5)
- ESTRG

  $0{,}053\left[\frac{BSingle\ Axis\ Load\ (tons)}{8{,}16}\right]^4$ (6)

ESTRT : Damage Rated for single-wheeled single e-axis vehicles.
ESTRG : Damaged Power Value for dual-wheel single-axis vehicles.
ESDRG : Damaged Power Value for dual-wheeled vehicles.
ESTRG : Damage Rated for vehicles with a double-wheel triple axis.

d) ***Calculating the Cumulative Equivalent Standard Axis (CESA)***

$ESA = (\boldsymbol{\Sigma} LHRT \times VDF \times D_L \times D_D$ (7)

$CESA = ESA \times 365 \times R$ (8)

ESA : Standard equivalent axis (ESA) for 1 day

LHRT	:	The annual average daily trajectory for specific vehicle types
VDF	:	Vehicle Damage Factors (*VDF)*
D_L	:	Lane Distribution Factors
D_O		Directional Distribution Factors
CESA		Cumulative equivalent standard axis load
365		Number of days in a year
R		Multiplier factors of traffic growth

Table 2. Lane Distribution Factor Value

Jumlah Lajur Setiap Arah	Kendaraan Niaga pada Lajur Rencana (% Terhadap Populasi Kendaraan Niaga)
1	100
2	80
3	60
4	50

(Source: Pavement Design Manual, 2017)

As for the directional distribution value Based on the 2017 Pavement Design Manual (MDP) regulations, for two-way roads, the directional distribution factor (DD) is generally taken a weight of 0.50 except in locations where the number of commercial vehicles tends to be higher in one particular direction.

e) ***Calculating Remaining Life***

The last step of the calculation analysis is to calculate the remaining service life of the road pavement using the following formula,

$$RL = 100 \times \left(1 - \frac{Np}{N_{1,5}}\right) \quad (9)$$

With;

RL	:	*Remaining Life*
NP	:	Cumulative W18 (CESA)/ year
$N_{1,5}$	:	Cumulative W18 (CESA) last year

To facilitate the flow of this study, you can see the calculation flow chart as follows:

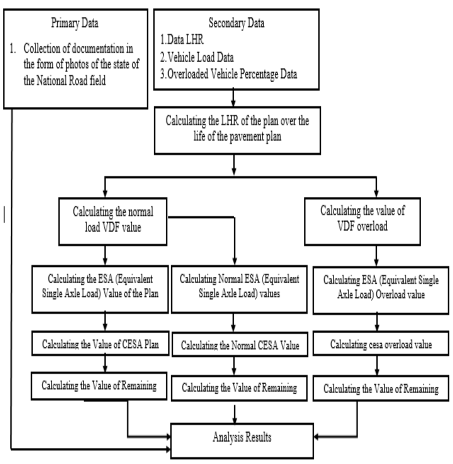

Figure 3. Calculation Flowchart

3. Result and Discussion

The analysis in this study uses the Bina Marga, 2013 Method. From the vehicle data obtained, there are several types of vehicle classifications. From the existing data, the analysis for this study is only for vehicles that fall into the classification of vehicle types in groups 3, 4, 5a, 5b, 6a, 6b, and 7a. For vehicles that do not put pressure on the pavement, such as class 1 vehicles (motorcycles) and class 8 (non-motorized), and vehicles with 0% annual LHR, such as car class 7b and 7c, calculations and evaluations are not carried out.

3.1. Calculating the Growth Rate

From the LHR data by P2JN, an analysis of the calculation of the traffic growth rate that occurred on the Sintang Highway was carried out as follows:

Table 3. Sintang Highway Vehicle LHR Data

Group	Vehicle Classification	LHR Year 2018 (Vehicles)	Year 2019 (Vehicles)	Year 2020 (Vehicles)	Year 2021 (Vehicles)
3	Passenger Cars	698	751	796	852
4	*Pick-up, Micro truck*	312	335	355	380
5a	Small Bus	30	32	34	36
5b	Big Bus	31	33	35	37
6a	2 Axis Truck	104	112	119	127
6b	Medium Truck 2 Axes	659	709	752	804
7a	3 Axis Truck	27	29	31	33
	Sum	1861	2001	2121	2270

(Source: National Road Planner and Supervision (P2JN))

From the data, the calculation of the growth rate that occurred was carried out; the following table recapitulates the growth rate during the life of the plan:

Table 4. Growth Rate Recapitulation (i)

Vehicle Classification	LHR Year 2018 (Vehicles)	Year 2019 (Vehicles)	Year 2020 (Vehicl	Year 2021 (Vehicles)	Growth Rate (i)
3	698	751	796	852	0,069
4	312	335	355	380	0,068
5a	30	32	34	36	0,063
5b	31	33	35	37	0,061
6a	104	112	119	127	0,069
6b	659	709	752	804	0,068
7a	27	29	31	33	0,069
Sum	1861	2001	2121	2270	0,068

(Source: Calculation Analysis)

3.2. Calculating LHR Over the Life of The Plan

After the calculation of the growth rate value, and the calculation of the LHR value during the life of the road pavement plan with each vehicle classification, the following is a table of LHR recapitulation during the life of the road pavement plan on the Sintang Highway:

Table 5. LHR Recapitulation Over The Life of the Plan a

Vehicle Classification	LHR				
	Year 2022 (Vehicles)	Year 2023 (Vehicles)	Year 2024 (Vehicles)	Year 2025 (Vehicles)	Year 2026 (Vehicles)
3	911	973	1041	1112	1189
4	406	433	463	494	528
5a	39	41	44	46	49
5b	40	42	45	47	50
6a	136	145	155	166	177
6b	859	917	980	1046	1117
7a	35	38	40	43	46
Sum	2424	2590	2767	2956	3157

(Source: Calculation Analysis)

Table 6. LHR Recapitulation Over The Life of the Plan b

Vehicle Classification	LHR				
	Year 2027 (Vehicles)	Year 2028 (Vehicles)	Year 2029 (Vehicles)	Year 2030 (Vehicles)	Year 2031 (Vehicles)
3	1271	1359	1453	1553	1660
4	564	602	643	687	734
5a	52	56	59	63	67
5b	53	57	60	64	68
6a	190	203	217	232	248
6b	1193	1274	1361	1454	1553
7a	49	52	56	60	64
Sum	3373	3603	3849	4112	4392

(Source: Calculation Analysis)

3.3. Calculating Vehicle Damage Factor

After calculating the LHR during the life of the plan, the calculation of the damage value was carried out using equation (3), equation (4), and equation (5). The following is the calculation of the common destructive power value:

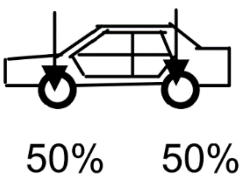

Figure 4. Class 3 Vehicle Load Configuration (*Bina Marga, 1983)*

Group. 3 = $\left(\frac{standard\ axis\ load\ (tons)}{standard\ axis\ load}\right)^4$

$$= \left(\frac{2 \times 50\%}{5,3}\right)^4 + \left(\frac{2 \times 50\%}{5,3}\right)^4 = 0,002535$$

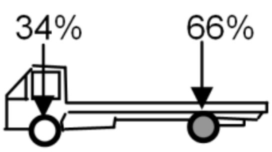

Figure 5. Class 4 Vehicle Load Configuration *(Bina Marga, 1983)*

Group. 4 = $\left(\frac{standard\ axis\ load\ (tons)}{standard\ axis\ load}\right)^4$

$$= \left(\frac{2 \times 34\%}{5,3}\right)^4 + \left(\frac{2 \times 66\%}{5,3}\right)^4 = 0,004119$$

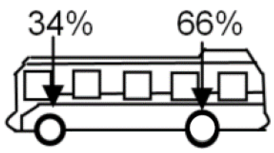

Figure 6. Class 5a Vehicle Load Configuration (Bina Marga, 1983)

Group. 5a = $\left(\frac{standard\ axis\ load\ (tons)}{standard\ axis\ load}\right)^4$

$$= \left(\frac{6 \times 34\%}{5,3}\right)^4 + \left(\frac{6 \times 66\%}{5,3}\right)^4 = 0,333606$$

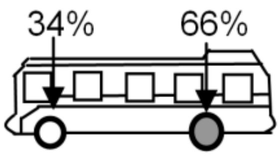

Figure 7. Class 5b Vehicle Load Configuration (Bina Marga, 1983)

Group. 5b = $\left(\frac{standard\ axis\ load\ (tons)}{standard\ axis\ load}\right)^4$

$$= \left(\frac{9 \times 34\%}{5,3}\right)^4 + \left(\frac{9 \times 66\%}{8,16}\right)^4 = 0,391910$$

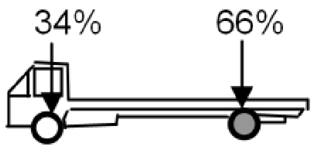

Figure 8. Class 6a Vehicle Load Configuration (Bina Marga, 1983)

Group. 6a = $\left(\frac{standard\ axis\ load\ (tons)}{standard\ axis\ load}\right)^4$

$$= \left(\frac{8,3 \times 34\%}{5,3}\right)^4 + \left(\frac{8,3 \times 66\%}{8,16}\right)^4 = 0,283484$$

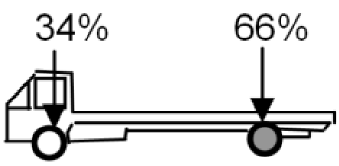

Figure 9. Class 6b Vehicle Load Configuration (Bina Marga, 1983)

Group. 6b = $\left(\frac{standard\ axis\ load\ (tons)}{standard\ axis\ load}\right)^4$

$$= \left(\frac{18,2 \times 34\%}{5,3}\right)^4 + \left(\frac{18,2 \times 66\%}{8,16}\right)^4 = 6,553926$$

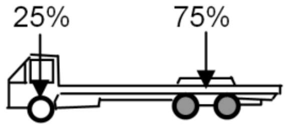

Figure 9. Class 7a Vehicle Load Configuration (Bina Marga,

Group. 7a = $\left(\frac{standard\ axis\ load\ (tons)}{standard\ axis\ load}\right)^4$

$= \left(\frac{25 \times 25\%}{5,3}\right)^4 + 0,086\ \left(\frac{25 \times 75\%}{8,16}\right)^4$

= 4,331236

Here's a table of recapitulations of standard destructive power values.

Table 6. Standard Destructive Power Value (VDF) Recapitulation

Group	Vehicle Classification	Axis Configuration	Vehicle Weight	MST (Ton)		VDF value
				Single Wheel	Dual Wheels	
3	Passenger Cars	1.1	2	5,3	8,16	0,0025
4	*Pick-up, Micro truck*	1.1	2	5,3	8,16	0,0041
5a	Small Bus	1.1	6	5,3	8,16	0,3336
5b	Big Bus	1.2	9	5,3	8,16	0,3919
6a	2 Axis Truck	1.2	8,3	5,3	8,16	0,2835
6b	Medium Truck 2 Axes	1.2	18,2	5,3	8,16	6,5539
7a	3 Axis Truck	1.2.2	25	5,3	8,16	4,3312

(Source: Calculation Analysis)

3.4. Calculating The Cumulative Equivalent Single Axle Load (CESA) Plan and Normal

Before calculating the CESA value, first, do the ESA value calculation. The calculation of the ESA value is carried out on each vehicle classification using equations (7) and equations (8). The following is an example of calculating the ESA value in group 3 of 2021:

ESA $= LHR \times VDF \times D_L \times D_D$
$= 852 \times 0,002535 \times 0,8 \times 0,5$
$= 0,8638$

After obtaining the ESA value, the CESA value calculation is carried out, here is an example of calculating the CESA value,

CESA Value in 2022 (CESA Year – 1)

Value ΣESA 2022 = 2340,7635

Value $CESA$ 2022 = $\Sigma ESA \times 365 \times R$

$= 2340,7635 \times 365 \times \frac{(1+0,0514)^1 - 1}{0,0514}$

= 854.378,68

With the same formula and method, the calculation of the CESA plan and CESA normal values is carried out with the difference in the value of the growth rate. The following table of recapitulation of ESA and CESA values:

Table 7. Recapitulation of ESA and CESA Value Plans Over the Life of Pavement Plans

Year	ESA	CESA Plan
2022	2.340,76	854.378,68
2023	2.499,94	1.874.232,52
2024	2.669,95	3.084.309,33
2025	2.851,52	4.512.735,98
2026	3.045,43	6.191.461,28
2027	3.252,53	8.156.755,96
2028	3.473,72	10.449.776,61
2029	3.709,95	13.117.202,07
2030	3.962,24	16.211.951,25
2031	4.231,69	19.793.992,79

(Source: Calculation Analysis)

Table 8. Recapitulation of Normal ESA and CESA Values Over the Life of Pavement Plans

Year	ESA	CESA Normal
2022	2.340,76	854.378,68
2023	2.499,94	1.887.376,00
2024	2.669,95	3.128.139,43
2025	2.851,52	4.610.196,76
2026	3.045,43	6.372.092,39
2027	3.252,53	8.458.114,43
2028	3.473,72	10.919.125,82
2029	3.709,95	13.813.514,10
2030	3.962,24	17.208.276,64
2031	4.231,69	21.180.260,59

(Source: Calculation Analysis)

3.5. Calculating Cumulative Equivalent Single Axle Load (CESA) Overload

The calculation of the cumulative value of vehicle overload equivalent (CESA) overload based on data obtained from UPPKB Sintang, the data used is the highest number of vehicles weighed in May 2022. The following is the vehicle data of UPPKB Sintang,

Table 9. UPPKB Sintang Vehicle Data (UPPKB Sintang)

Group	Vehicle Configuration	JBI (Tons)	Number of Vehicles (vehicles/day)	Breaking (Vehicle/Day)	% Breaking	% Not Breaking
4	1.1	2	23	11	47,83	52,17
6a	1.2	8,3	31	25	80,65	19,35
6b	1.2	18,3	26	21	80,77	19,23
7a	1.2.2	25	17	9	52,94	47,06

From the load data of vehicles entering the weighbridge, the calculation of the damaged power value is carried out, such as the calculation of the standard load damage value, but using overload load. The following table recapitulates the damage value of vehicles with overload,

Table 10. Recapitulation of the Damage Value of Overload Vehicles

Group	Vehicle Classification	Axis Configuration	Vehicle Weight	MST (Ton) Single Wheel	Dual Wheels	VDF value
3	Passenger Cars	1.1	2	5,3	8,16	0,0025
4	*Pick-up, Micro truck*	1.1	2,1961	5,3	8,16	0,0060
5a	Small Bus	1.1	6	5,3	8,16	0,3336
5b	Big Bus	1.2	9	5,3	8,16	0,3919
6a	2 Axis Truck	1.2	8,8903	5,3	8,16	0,3731
6b	Medium Truck 2 Axes	1.2	19,9644	5,3	8,16	9,4895
7a	3 Axis Truck	1.2.2	27,0518	5,3	8,16	5,9380

(Source : Calculation Analysis)

Then, based on UPPKB Sintang vehicle data, it is assumed that the percentage of vehicles violating from the number of LHR, the following is a table of recapitulation of the assumption of the number of vehicles violating and not violating in 2021,

Table 11. Recapitulation of The Assumption of the Number of Violating and Non-Infringing Vehicles in 2021 (UPPKB Sintang)

Group	Number of Vehicles	Exceed	Breaking %	LHR 2021	Number of Violations	Number of Non-Breaking
3	0	0	0	852	0	852
4	23	11	47,83	380	182	198
5a	0	0	0	36	0	36
5b	0	0	0	37	0	37
6a	31	25	80,65	127	102	25
6b	26	21	80,77	804	650	155
7a	17	9	52,94	33	17	15

After calculating the assumptions of the vehicle violating and not violating, the calculation of the value of the ESA violated and did not violate during the life of the plan using equation (7), after obtaining the ESA value, a CESA value calculation was carried out using equation (8) during the life of the plan, the following table recapitulates the ESA and CESA values during the life of the plan.

Table 12. Recapitulation of ESA and CESA Overload Values Over The Life of the Plan

Year	*ESA*	*CESA Overload*
2022	3.171,33	1.157.534,96
2023	3.617,34	2.557.077,10
2024	3.863,35	4.238.119,06
2025	3.863,35	6.246.088,75
2026	4.126,09	8.633.211,32
2027	4.706,39	11.459.494,54
2028	4.706,39	14.793.854,90
2029	5.026,47	18.715.404,57
2030	5.368,31	23.314.921,85
2031	5.733,40	28.696.531,36

(Source: Calculation Analysis)

From the CESA values obtained according to scenario 1, scenario 2, and scenario 3, a comparison of the CESA values of 3 scenarios was carried out. Here's a comparison table of CESA values in 3 scenarios,

Table 13. Comparison of CESA Plan, Normal CESA, and CESA Overload Values

Year	*CESA* Plan	Normal	*Overload*
2022	854.378,68	854.378,68	1.157.534,96
2023	1.874.232,52	1.887.376,00	2.557.077,10
2024	3.084.309,33	3.128.139,43	4.238.119,06
2025	4.512.735,98	4.610.196,76	6.246.088,75
2026	6.191.461,28	6.372.092,39	8.633.211,32
2027	8.156.755,96	8.458.114,43	11.459.494,54
2028	10.449.776,61	10.919.125,82	14.793.854,90
2029	13.117.202,07	13.813.514,10	18.715.404,57
2030	16.211.951,25	17.208.276,64	23.314.921,85
2031	19.793.992,79	21.180.260,59	28.696.531,36

(Source: Calculation Analysis)

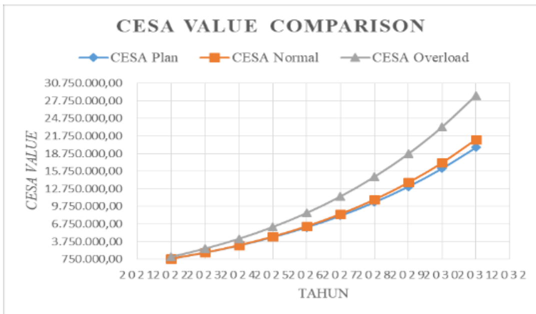

Figure 11. CESA Value Comparison (*Calculation Analysis)*

3.6. Calculating the Residual Age of Service

Based on the obtained CESA value, a calculation of the decrease in the service life of road pavements was carried out with 3 scenarios. Calculating the decrease in service life using equation (9). The following is an example of calculating the decrease in the service life of road pavements,

Known:

Np = *CESA* plan 2022 = 854.378,676

N1,5 = *CESA* plan 2031 = 19.793.992,786

RL Value $= 100 \times \left(1 - \frac{Np}{N1{,}5}\right)$

$= 100 \times \left(1 - \frac{854.378{,}676}{19.793.992{,}786}\right)$

= 95,68 %

Calculations are carried out in the same way during the life of the plan according to scenarios 1, 2, and 3. The following table recapitulates the plan's reduced service life, normal, and overload.

Table 14. Recapitulation of Remaining Life Plans

Year	Np	N1,5	*Remaining Life* (%)
2022	854.378,676	19.793.992,786	95,68
2023	1.874.232,515	19.793.992,786	90,53
2024	3.084.309,334	19.793.992,786	84,42
2025	4.512.735,978	19.793.992,786	77,20
2026	6.191.461,285	19.793.992,786	68,72
2027	8.156.755,961	19.793.992,786	58,79
2028	10.449.776,609	19.793.992,786	47,21
2029	13.117.202,069	19.793.992,786	33,73
2030	16.211.951,248	19.793.992,786	18,10
2031	19.793.992,786	19.793.992,786	0,00

(Source: Calculation Analysis)

Table 15. Recapitulation of Normal Remaining Life

Year	Np	N1,5	*Remaining Life* (%)
2022	854.378,68	19.793.992,79	95,68
2023	1.887.376,00	19.793.992,79	90,46
2024	3.128.139,43	19.793.992,79	84,20
2025	4.610.196,76	19.793.992,79	76,71
2026	6.372.092,39	19.793.992,79	67,81
2027	8.458.114,43	19.793.992,79	57,27
2028	10.919.125,82	19.793.992,79	44,84
2029	13.813.514,10	19.793.992,79	30,21
2030	17.208.276,64	19.793.992,79	13,06
2031	21.180.260,59	19.793.992,79	-7,00

(Source: Calculation Analysis)

Table 16. Recapitulation of Remaining Life Overload

Year	Np	N1,5	*Remaining Life* (%)
2022	1.157.534,961	19.793.992,786	94,15
2023	2.557.077,097	19.793.992,786	87,08
2024	4.238.119,063	19.793.992,786	78,59
2025	6.246.088,750	19.793.992,786	68,44
2026	8.633.211,320	19.793.992,786	56,38
2027	11.459.494,538	19.793.992,786	42,11
2028	14.793.854,905	19.793.992,786	25,26
2029	18.715.404,572	19.793.992,786	5,45
2030	23.314.921,850	19.793.992,786	-17,79
2031	28.696.531,364	19.793.992,786	-44,98

(Source: Calculation Analysis)

Based on the analysis of remaining life plans, normal, and overload, the following comparison can be seen,

Table 17. Comparison of Remaining Life Values

Year	*RL* Rencana (%)	*RL* Normal (%)	*RL Overload (%)*
2022	95,6836	95,6836	94,1521
2023	90,5313	90,4649	87,0815
2024	84,4180	84,1965	78,5889
2025	77,2015	76,7091	68,4445
2026	68,7205	67,8079	56,3847
2027	58,7918	57,2693	42,1062
2028	47,2073	44,8362	25,2609
2029	33,7314	30,2136	5,4491
2030	18,0966	13,0631	-17,7879
2031	0,0000	-7,0035	-44,9760

(Source: Calculation Analysis)

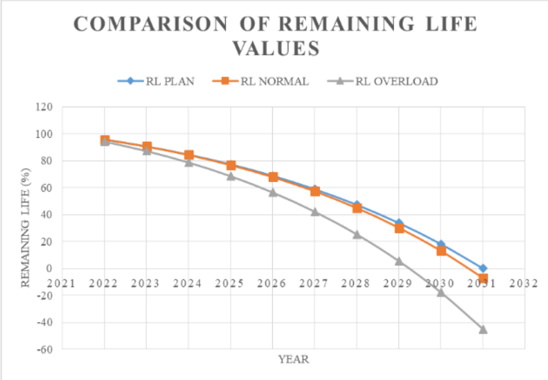

Figure 12. Remaining Life Comparison (*Calculation Analysis*)

Based on the calculation analysis carried out, it was found that the planned road pavement lasted for 10 years and could only last for 8.23 years, or a decrease of 1.77 years. However, the decrease that occurs only based on the analysis of excess load entering the weighbridge, there are some vehicles that deliberately avoid the inspection of the weighbridge to avoid sanctions, so it can be ascertained that the decrease that occurs in the field will be greater. There are many other factors that cause road damage. On the Sintang Highway, there are several points of damage that occur, such as cracks and holes and the release of materials from the road body caused by the frequently flooded road body at the location. Here is some field documentation of the current condition of the road and some ODOL vehicles crossing the road.

Figure 13. ODOL Vehicles on Sintang Highway *(Field Survey, June 2022)*

Figure 14. Condition of Sintang Highway *Field (Survey, June 2022)*

4. Conclusion

Based on the research and analysis that has been carried out, the following conclusions can be drawn,

1. The amount of CESA value is influenced by the damage power value of the vehicle, the greater more vehicles that violate the JBI, the greater the value of the vehicle's damage power to road pavements.
2. Based on the calculation analysis from vehicle data entering the weighbridge, road pavement was only able to last for 8.23 years or experienced a decrease in the service life of 1.77 years.
3. Analysis of scenario 2 with growth rate data based on field data and vehicles of normal weight proved that road pavement can last up to 10 years with a slight decrease in road conditions.

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6. Authors' Note

Everything written in this article is original because it sums up my studies with Mr. Dr.-Ing. Ir. Slamet Widodo, M.T., IPM., and Mrs. S. Nurlaily Kadarini, S.T., M.T., IPM. The contents of this article have been reviewed in a thesis defense at the Department of Civil Engineering, University of Tanjungpura, on 27 September 2022 by Mr. Ir. Komala Erwan, M.T. IPM. ASEAN Eng. ACPE and Mr. Heri Azwansyah, S.T., M.T., IPM.

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