Impact Simulation Axle Truck with Excess of Achievements Age Content Services

(Case Study of North Beach Road from Tangerang to Losari, Central Java)

Reni Karno Kinasih
Postgraduate Student Civil Engineering Transportation,
University of Indonesia.
Also Lecture Civil Engineering,
Satyagama University, Jakarta.
Email : re.kinasih@gmail.com

***Abstract*- Overloading phenomenon is a common view in Indonesia, accused of early damage on pavement. This thesis is trying to evaluate the differences between two conditions, first condition as if overloading truck bring 5%,10%, 15%,20%, 25% and 30% more load, and the second condition as if applied zero overloading and used 6-axle-truck to accommodate unloaded logistics. Liddle's formula will be used with the k factor 1 for tandem axle, 0.086 for tandem, and 0.031 for tridem axle. Service life significantly differ between the first and the second condition.**

***Index Terms*— Overloading truck, excessive, vehicle**

I. INTRODUCTION

1.1. Background

Transportation has is one of the necessary tools for developing a community group, in aspects of life. No doubt the most important transport into industry in the world, people need transportation every day of their lives, either for political activity, economic, social, cultural, defense and security.

There are several factors regarding the transportation, the ***first factor*** is the speed, reliability and frequency of services. ***The second factor*** is the equipment used, for service users affect comfort and safety equipment. ***The third factor*** is the cost of transportation. These factors need to be considered to present a humane transportation because as stated by ***John J. Coyle, et al (2003)*** in his book entitled Transportation that transportation should not merely be seen as the movement of people or goods through space. Users actually buy the service for a price agreed to be paid[1].

In the book described how a good transportation system affects the economic, environmental, social and political. Mentioned Transportation that the system has a very large impact on the development of patterns of population and economy,an increase in the transport system a certain area will give the effect of an increase in land value as land becomes more accessible and more useful[2]. Transportation also generates the value of a product, as an illustration, a number of excessive commodity in a city of its value will decrease, but if sent to another city that requires surely increase the value of benefits and costs. It later became the territory of the concept of specialization in the sense of a region can produce a concentrate product, respectively, regions can specialize, producing large-scale and improve the productivity of their lands without worry, because the system must have good transport their products to the region area others where the value will be higher, while the area requirement can also be met from the producing regions. When the territories began producing their leading commodity each and distribute them to other areas, which appear later are large vehicles with a variety of payloads. Entrepreneurs think of ways to send them to another city commodity in the most rapid and cheap, so do not be surprised if the end is often found that the trucks or containers carrying overloaded.

Overload phenomenon in developing Countries such as Indonesia, China, the Philippines is still a lot going on. Overloaded vehicle carrying a common sight. A news lifted the fact that in the North Coast Line (North Coast) Central Java breach load transport by vehicles traveling through it, from 18 offenses committed by public transport vehicle types passing buses and trucks, 14 of the which are in violation of excess load transport, while remaining a three-dimensional offense and an incomplete vehicle documents[3]. (Pikiran Rakyat Newspaper, dated 02/21/03).

For employers carry overload will reduce the cost of shipping them, whereas with a truck tire pressure overloaded trucks on the pavement to make an impact for the service life of the pavement. No wonder that the pavement be easily damaged, although there are still factors Other factors that Affect the service life of pavement life such as weather conditions, subgrade conditions, quality of materials, up to the quality of making the pavement. Nationwide, overload phenomenon is detrimental to the State, not the other way around. Immediate effects and other public employers is the condition of the road will increase travel time, fuel consumption and vehicle Quickly becomes more broken.

Nearly 60% of Indonesia's population live in Java, it is also a place on the island of concentrating various centers of economic activity both on a national, international as well as, the role of transportation network system in this region is very important and strategic so that must always be maintained and

[1] *John J. Coyle, and Edward J. Bardi. Management of Businees Logistics: A Supply Chain Perspective. January 22, 2002. ISBN-13: 978-0324007510. ISBN-10-0324007510. Edition 7th.*

[2] *Ibbid, John J. Coyle.*

[3] Pikiran Rakyat Newspaper, Indonesia, dated February ,21 2003

enhanced performance. If the transport network system performance in Java can be distracted too disrupted the economy both in the scale of local, regional, and national levels.

Various attempts were made by the government to tackle this phenomenon overloaded, like conduct weigh bridges at various points, to reduce the allowable overload capacity. Prior to 2008 the Department of Transportation to allow it to charge over 50% of its capacity, then in August 2008 permits more charge was reduced so that only 30% of its capacity. While the latest policy of the Department of Transportation stated in Law No. 22 of 2009.

Opposition then as long as there is either allowed overload (overload permit) or illegal then the age of the pavement service life will be difficult to achieve. It is known that the technical cause of bad roads include:

1. ***Environmental Factor.*** Environmental conditions in Indonesia not support road conditions can last for a long time. The weather was hot and humid, and the prolonged rainy season, while the asphalt mixture sensitive to temperature, humidity and water. Contamination at the time of manufacture such as rocks wet or dry will cause vulnerabilities less holding capacity, as well as when the asphalt content is less.

2. ***Load Factor.*** Dimensions, weight and load of the loaded vehicle will cause a compressive force to the axis of the vehicle. Compressive force will contribute to the road surface. It can accelerate the wear of the road surface, what more if there was an additional burden on the axis in the two-wheel axles (axis) to twice the standard load will lead to increase in destructive power 16 times. If the load axis to 3 times, power is broken into 81 times. With these conditions, the planned path is not broken for eight years would be damaged in the first 1 year.

Overloading zero policy should be enforced, while the poor condition of law enforcement in Indonesia make-this kind of policy is still vulnerable violated. The solution is that if it is good enough to condition the entrepreneur and reviews those who deign to expedition activities to use trucks that have axle configuration if cargo Excess members smallest effect on pavement damaged pavement.

It is already known that the truck with the axis configuration which will result in more damage less than a truck with fewer axes. At first glance it seems to be a solution if the zero overloading policy guidelines are enforced and propagated the use of trucks with more axes. This truth will be the focus of this research.

1.2. Definition

Roads

According to the Indonesian Government Regulation No. 34 of 2006, Understanding the Way is a land transport infrastructure which includes all parts of the building including complementary and equipment intended for traffic, both located on the ground level, above ground, below ground or water surface , as well as on the surface of the water, except railroad, road lorries, and the cable[4].

[4] The Indonesian Government Regulation No. 34 of 2006

In Indonesia Highway 4 classification classified in the classification According to the function of roads, road class, road terrain and according to road maintenance authority (Directorate General of Highways 1997). According to its function, the road is classified into 3 groups, namely[5]:

1. ***Way arterial road*** serving the main transport characteristic with long-distance journey, dashboard displays average high, and the limited number of driveways efficiently.
2. ***Way collector roads*** that serve the transportation collector / divider with characteristic travel distance is the average speed is limited and the number of incoming roads.
3. ***Local road*** that is the way that serve local transport journey traits close range, average speed is low, and the number of driveways is not restricted.

Roads Pantura

North coast road (North Shore Line/Pantura) is the term commonly used to refer to the national road to forming along the 1,316 miles between ***Merak to Kupang, Banyuwangi*** along the north coast of the island of Java, especially ***Jakarta and Surabaya***[6]. This pathway was first created largely by Herman *Willem Daendels, Governor-General of the Dutch East Indies were ruled between the 36th Daendels Year 1808-1811*[7].

Daendels Build Post Road (De Grote Postweg) from ***Anyer to Panarukan*** in late 1908 with the aim of maintaining the island of Java from the invasion of England[8]. In Napoleon war era, the Dutch conquered by France and being in a state of war with the British. Post Road was originally built for the military defense of the Netherlands at that time.

1.3. Identify the Problem

Ministry of Industry of the Republic of Indonesia in Circular number: SE.02 / AJ.108 / DRJD / 2008 on: a calculated maximum limit Guide JBI (total allowable weight) and JBKI (Total weight combination is allowed) for car and goods, specialty vehicles, vehicles Withdrawal following patch Train / Train Towing set JBI / JBKI and lowest based on the grade that may be passed by the vehicle in question According to the axis configuration[9]. Although various irregular been made with overload phenomenon that has not yet been resolved but the practice is still rampant overload, from the which it is evident that the problems identified pavement will be widened

[5] The Function roads in Indonesia, according to the Directorate General of Highways, Ministry of Public Works, 1997.

[6] North Coast (North Shore Line) is the term commonly used to refer to the national road forming along the 1,316 miles between the Peacock until mussels, Banyuwangi along the north coast of Java.

[7] Herman Willem Daendels, Governor-General of the Dutch East Indies Daendels 36th year reign between 1808-1811 in Indonesia.

[8] *Ibbid,* Deandels.

[9] Ministry of Industry of the Republic of Indonesia in Circular number: SE.02 / AJ.108 / DRJD / 2008 on: a calculated maximum limit Guide JBI (Total allowable weight) and JBKI (Total weight combination is allowed).

Easily damaged and pavement design life is not Achieved, even premature failure are more common.

1.4. Significance the Problem

This is a road damage following a data contributor Hedrianto Notosugondo obtained from the Director General of Highways, Ministry of Public Works as follows[10]:

1. Contribution overload on damage to roads was 60 percent.
2. Because 20 percent Drainage
3. Rest because of natural disasters and faulty construction.

Seen that the overload problem very dominant cause damage to roads PROVE this problem is very significant to note.

1.5. Problem Formulation

From the above, significant problems could be handled as follows:

1. How does the configuration of each axle truck with overload respectively 5%, 10%, 15%, 20%, 25% and 30% of the life of the pavement?
2. How the efficiency of each axle truck?
3. How does a zero policy enforcement and user overloading trucks with more damage to axis 1 to Overcome premature pavement?

1.6. The Purpose of the Study

Objectives to be achieved from this research are:

1. Examine the impact of excess charge 5%, 10%, 15%, 20%, 25% and 30% of the age of the pavement.
2. Getting the numbers of each type of axle efficiency.
3. How does a zero policy enforcement and user overloading trucks with more axis to Overcome premature damage to the pavement.
4. Contribution to science, especially in the field of road.

1.7. Limitations

There is a limit used in this study are:

1. The case study conducted at the National Highway North Coast of Java (coast) from ***Tangerang*** to ***Losari***, so the condition of the traffic load using the traffic conditions in the area.
2. Type truck will be analyzed in this study is the type of trucks that crossed the northern coast path at the time the survey was conducted.
3. The amount of excess load that will be used is 5%, 10%, 15%, 20%, 25% and 30%.
4. Simulation will be done by diverting cargo to be loaded in excess of 6 axles semi truck traile with 1.22-222 axle configuration.

II. CHAPTER 2

2.1. Methodology

The methodology used in this research is quantitative method. The process starting from the selection of a research strategy, the research process, research variables, research instrument, data collection and processing, data analysis and conclusions.

2.2. Research process

The process of research conducted to answer the problem formulation is proposed:

1. Collect data daily traffic (LHR) in a location that is used as a case study of the National Roads Pantura. And secondary data from the Center for Research Roads and bridges, research and Development Agency, the Ministry of Public Works is located in Bandung West Java.
2. Calculated ESALs with normal load, use the formula Liddle with factor k = 0.086 for the tandem axis and k = 0.031 for Tridem axis.
3. Validation. Validate the results of the calculation of ESALs needs to be done to check if the author uses Liddle formula correctly.
4. Calculated ESALs with overload respectively 5%, 10%, 15%, 20%, 25%, and 30%.
5. Calculating the efficiency of the charge axis.
6. Simulation by collecting all of the commercial vehicle maximum load carrying capacity According JBI / JBKI and use a semi-trailer truck 6 axles to carry the excess charge of the entire existing LHR.
7. Calculating normal CESA 7 with excess charge 5%, 10%, 15%, 20%, 25% and 30% who have performed simulations.
8. Calculating age ministry pavement.
9. Interesting conclusions.

2.3. Research Variables

Study variables are constructs that are already given the values in the form of numbers that have two or more values in the continuum. While it constructs a concept that can be measured and enjoyed.

Research variables there are two independent variables and the dependent variable. Free variable is a variable stimulus variable or variables that affect the other. While the variable is bound to react or respond when connected to the free variables. Dependent variable is a variable that can be enjoyed and measured factors to Determine the influence arising out of free variables.

In this study the variable is a truck axle configuration and overload as independent variables that affect the amount of ESAL numbers and CESA.

III. CHAPTER 3

3.1. Calculation Analysis

Liddle ESALs calculation using the formula Described Previously, with using the k factor of 0.086 and 0.031 for the tandem axis to axis Tridem. The calculations show that if the vehicle is carrying a load up to 30% overload, it will increase the numbers ESALs in the range 25% to 288% with the

[10] Hendrianto Notosugondo Director General of Highways, Ministry of Public Works, Indonesia.

average rate of 283%, almost a 10-fold excess of the carrying charge.

Similarly, carrying overloaded by 25% and 20% increase in ESALs nearly 10 times the number range 238% to 246% and the average rate of 242% for 25% overload serta187% up to 209% and the average number of 205 % to overload it by 20%.

Even worse when the commercial vehicle carrying a payload greater than 5%, although briefly overload brought about only a little but the impact is not in agreement. When carrying a payload over 5% of the capacity that should, instead ESALs figure rose to almost 10% as the charge-fold excess of 20%, 25% and 30%. ESALs not figure increased by 50% but actually increased 122% to 153%, with an average rate of 125%. Meanwhile, if you carry a payload of as much as 10% excess ESALs will increase is by 132% to 148% with the average rate of 145%. ESAls Increased by 171% to 177% experienced when the vehicle carries a charge of 15% more than the capacity should be, and the average number amounted to ESalsnya average increase of 173%.

Look also figures efficiently between the load axis configuration. Of the various types of semi-trailer trucks were recorded at LHR north coast road, which has the highest efficient rate is 6 axles semi trailer with a 12.20 figure. While the group is not a trailer or a trailer truck, it is efficient to have the highest number is 2 as a small truck with 20,526 digits. The number of temporary low efficient owned by a large truck with figure 2 as 6279. When a truck carrying a payload of 30% exceeds the permitted capacity will Decrease the efficiency rate is up to more than twice that amountwhich ranged between 1.99 to 2.22 times, with an average value of 2.17 times. With the truck axle configuration will result in different efficiency figures are not the same, look at the semi-trailer truck that has 5 axles axle configurations from 1.2 to 222 and 5 axles semi trailer truck that has a wheelbase configuration 1.22-22. 5 semi-trailer truck as having a higher efficiency rate when compared with the configuration having 1.2-222. This will be significant differences when the more striking differences between the configurations such as the semi-trailer axles configured 5 more striking as between a semi-trailer with 5 axles configured 1.22-22 truck 1.2-222 5 as usual.

3.1. Calculation Analysis Simulation

The simulation was performed using all of the vehicles in the north coast road which carries no excess charge, then the need to transport cargo that has not been raised will be accommodated with a semi trailer truck 6 axles with axle configuration 1.2-222.

The following table is an additional need for a fleet of trucks double 6 as Necessary, while for more details contained in Table 3.1. attached:

TABLE 3.1: SUMMARY OF SEMI TRAILER TRUCK FLEET 6 AXLES

MORE CONTENT	CONTENT TRUCK 6 Axles
5%	1694
10%	3388
15%	5082
20%	6776
25%	8470
30%	10164

The addition of a semi trailer truck fleet 6 as changing table LHR conditions, especially on the number of vehicle semi-trailer axles and 6 percent of vehicles in the LHR. LHR originally amounted to 315 071, after the addition of a semi trailer truck 6 as in the case with 5% overload LHR be 316 765, with a 10% excess charge will be increased LHR 318 459, when it reaches 15% more payload into a 320 153 LHR, overload reaches 20 % increase LHR would be 321 847, while for the excess charge 25% and 30% to LHR figure of 323 541 and 325235. this means most large overload in this study, namely 30%, if the simulation will increase by 3.23% LHR of the amount of the original LHR.

3.4. Calculation Analysis CESA

From the calculation of CESA good in condition of commercial vehicles carrying overloaded and simulation conditions obtained figures which can be seen in Table 3.2. attached..

TABLE 3.2: SUMMARY OF SUPPLEMENTARY FIGURES CESA

MORE CONTENT	**CESA**	CESA SIMULATED
0%	87377.23	87377.23
5%	102948.31	90502.20
10%	125862.71	93627.17
15%	148086.43	96752.14
20%	175674.40	99877.11
25%	206776.94	103003.08
30%	241967.43	106127.05

Sources: Data Processing

1. Commercial vehicle carries an average of as much as 5% overload will raise as much as 117.8% rate of CESA CESA with appropriate charge JBI / JBKI maximum.
2. Commercial vehicle carries an average of as much as 10% overload will raise as much as 1148% rate of CESA CESA with appropriate charge JBI / JBKI maximum.
3. Commercial vehicle carries an average of as much as 15% overload will raise as much as 169.5% rate of CESA CESA with appropriate charge JBI / JBKI maximum.
4. Commercial vehicles carrying excess load average by 20% would raise as much as 201.1% rate of CESA CESA with appropriate charge JBI / JBKI maximum.
5. Commercial vehicles carrying excess load on average by 25% would raise as much.as 236.6% rate of CESA CESA with appropriate charge JBI / JBKI maximum.
6. Commercial vehicle carries an average of as much as 30% overload will raise as much as 277% rate of CESA CESA with appropriate charge JBI / JBKI maximum.

After simulation the decrease are as follows:

1. In the case of commercial vehicles carry average excess charge as much as 5% and the simulation will reduce the number of CESA CESA as much as 88% of the simulations were not performed.
2. In the case of commercial vehicles carry average excess charge as much as 10% and will reduce the number of simulations performed by 74% of the CESA CESA is not conducted a simulation.
3. In the case of commercial vehicles carry average excess charge as much as 15% and will reduce the number of simulations performed CESA CESA as much as 65% of the simulations were not performed.
4. In the case of commercial vehicles carry average excess charge as much as 20% and will reduce the number of simulations performed CESA CESA as much as 57% of the simulations were not performed.
5. In the case of commercial vehicles carry average excess charge as much as 25% and will reduce the number of simulations performed CESA CESA as much as 50% of the simulations were not performed.
6. In the case of commercial vehicles carry average excess charge as much as 30% and will reduce the number of simulations performed CESA CESA as much as 44% of the simulations were not performed.

Furthermore, seen from the graph that shows the decline in numbers CESA can be seen in Chart 3.1.

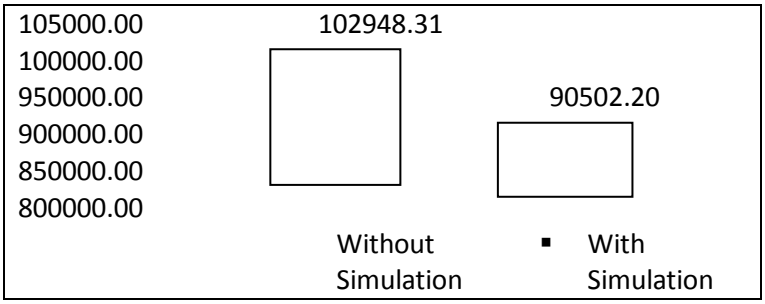

Figure 3.1. Payload Comparison Chart CESA with excess 5%

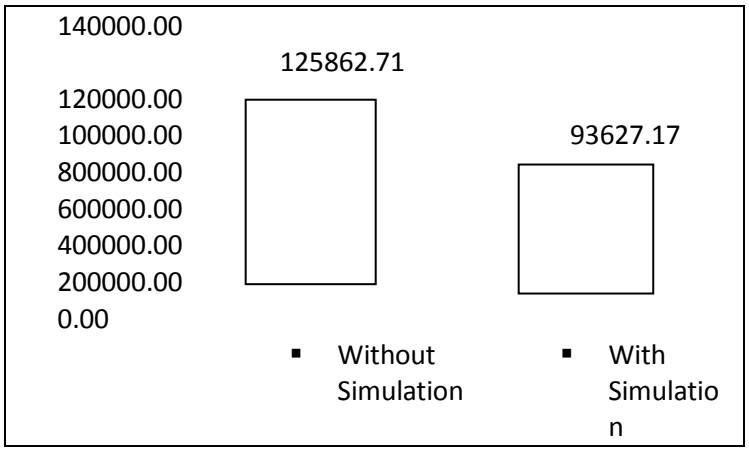

Figure 3.2. Payload Comparison Chart CESA with excess 10%

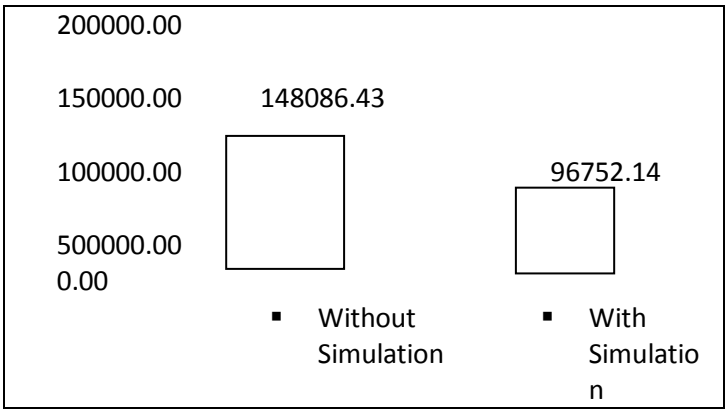

Figure 3.3. Payload Comparison Chart CESA with excess 15%

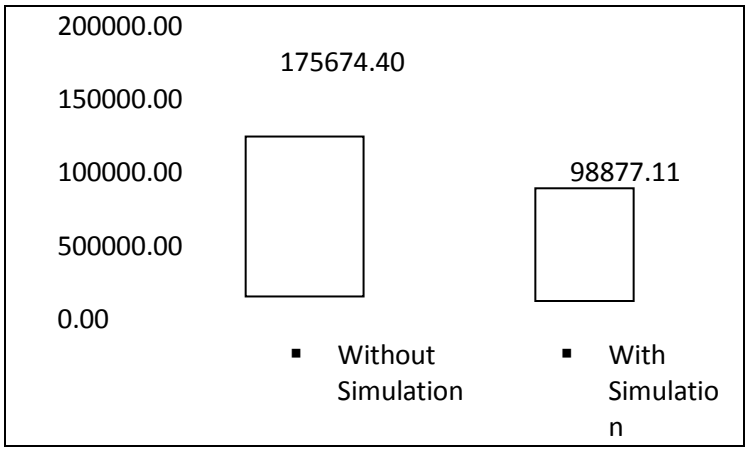

Figure 3.4. Payload Comparison Chart CESA with excess 20%

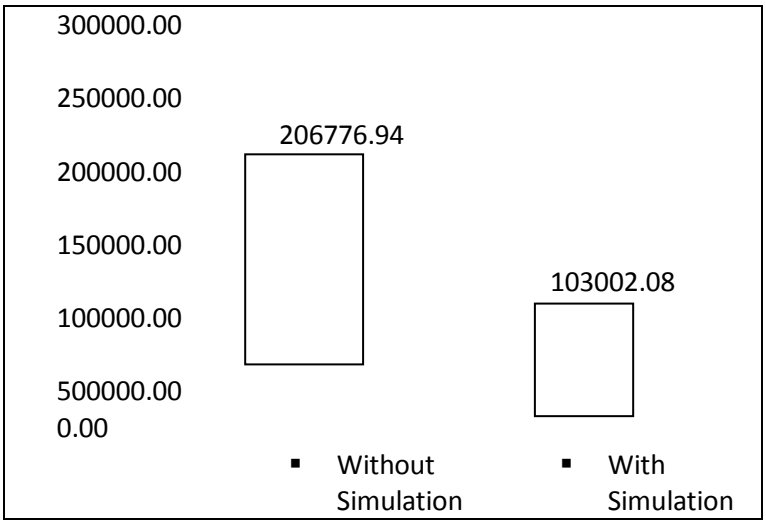

Figure 3.5. Payload Comparison Chart CESA with excess 25%

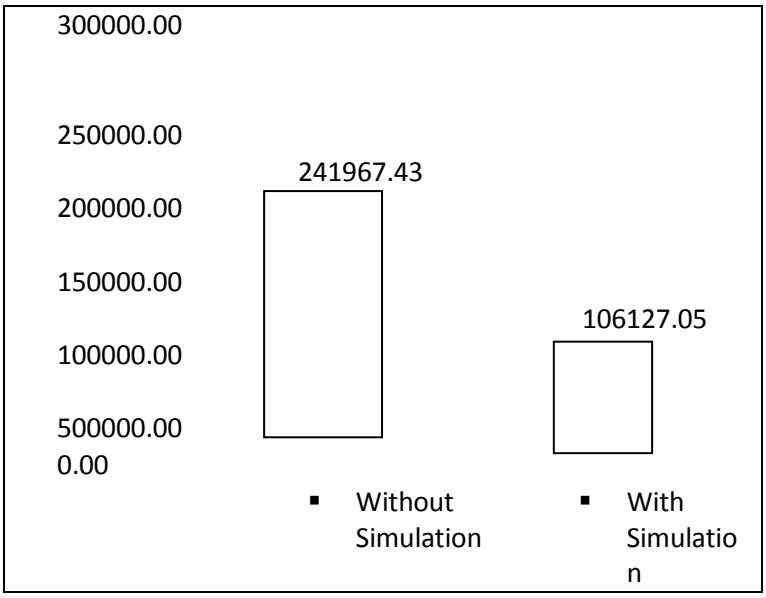

Figure 3.6. Payload Comparison Chart CESA with excess 30%

1.5. Age Analysis Services

With the growth of commercial vehicles in the north coast road by 7% per year, the project conducted traffic flow and CESA projections for the next 10 years to base the determination of service lifeIn table 3.2 it can be seen recapitulation good pavement service life by experiencing an overload condition or conditions have been performed simulations.Table 3.2. Pavement Age Recapitulation Service

Payload More	Age	
	Without Simulation	Simulated
0%	10.00	10.00
5%	7.58	9.49
10%	4.61	8.98
15%	2.12	8.50
20%		8.02
25%		7.58
30%		7.13

TABLE 3.2. PAVEMENT AGE RECAPITULATION SERVICE

From the table above recapitulation service life can be seen that if the condition is left overloaded commercial vehicles carrying an average of 20% on each vehicle it will spend in the first year of service life. Meanwhile, if the commercial vehicle is no longer carrying overloaded vehicles and semi-trailers used to transport logistics 6 as the rest then even up to as much as 30% more though still capable serve pavement road for 7:13 years. In the graph below shows how significant difference between conditions with overload and simulation conditions.

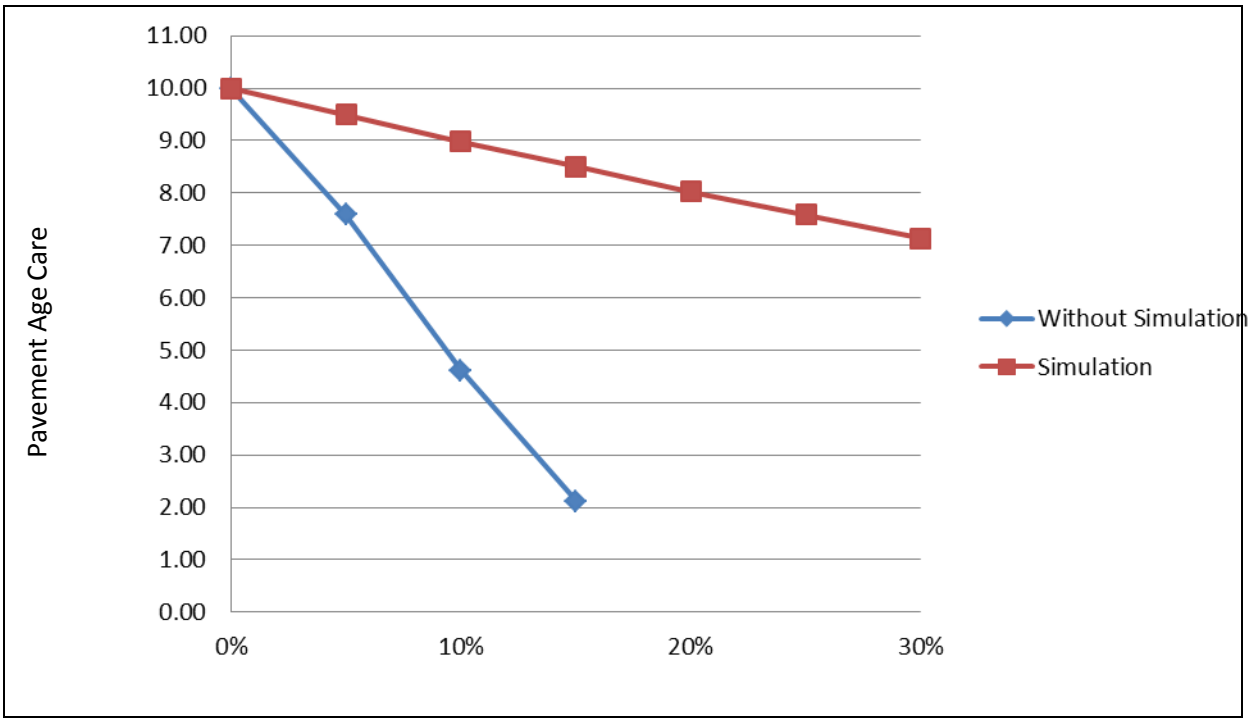

Figure 3.7. Graphic Comparison of Age Care Pavement

IV. .CHAPTER 4 CONCLUSION AND SUGGESTION

4.1. Conclusion

From the description of the results of this study can be summarized as follows:

1. Commercial vehicles carrying overloaded by 5% will be lowered as much as 2.4 years of service.
2. Commercial vehicles carrying overloaded by 10% will be lowered as much as 5.4 years of service.
3. Commercial vehicles carrying overloaded by 15% will be lowered as much as 7.9 years of service.
4. Commercial vehicles carrying overloaded by 20% will spend the first year of service life.
5. From the type of truck semi trailer, semi-trailer truck 6 axles with axle configuration has a value 1.22-222 greatest efficiency, while it is from the class of ordinary small truck axle truck 2 axles with 1.1 configuration has the highest efficiency value.
6. If the policy enforced zero overloading vehicles and semi-trailers used to transport logistics 6 axles which is not transported due to the overloading of zero enforcement of the policy in terms of pavement service life it is very advantageous compared to let commercial vehicles carrying overloaded as it happens now.

4.2. Suggestion

Based on the above conclusions, there are some suggestions that may be made include:

1. To check the condition of traffic flow that can be taken are in conformity tindfakan to support this scenario.
2. Switch the logistical system of the vehicle mode or modes of railway commercial marine vessels.
3. Make the gateway system as on the highway, with the technology that can automatically calculate the number of commercial vehicles carrying excessive fines loads. Fine amount Multiplied by the length of the trip has been selected in the door to get out. At the exit available teller to include a number of fines that can open portals and other vehicles can exit from the main road. Here conditioned road users do not see the officer that occurred multiplied negotiations, and the amount of the fine must be commensurate with the large amount of damage Inflicted each vehicle.
4. Add the correction factor in pavement design stage to avoid this damage.

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