



# **USER COST ESTIMATION ON FLEXIBLE AND RIGID PAVEMENT**

*Fajar S. Handayani*

*Rheza Imam, Aria Ramandika*

*F. Pungky Pramesti*

*M. Agung Wibowo*

*Ary Setyawan*



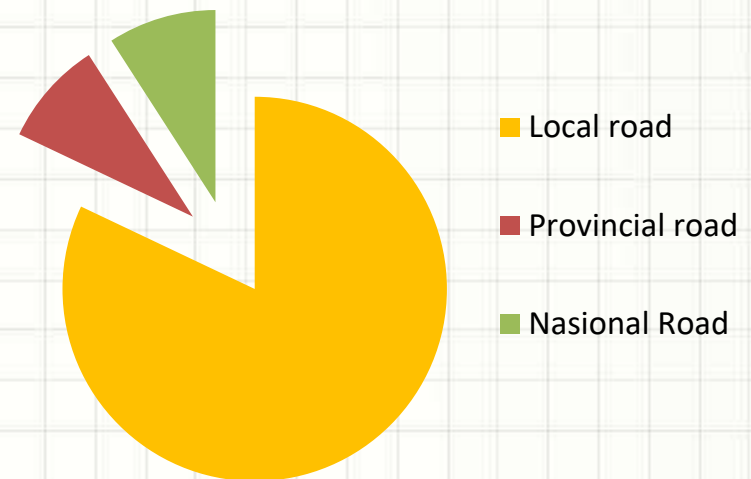
# Introduction

- The unsatisfactory condition of Indonesia's local roads need to be improved to support the national transportation network

Road Length by Authority Portion

Road Status	Length (KM)	Road Condition	
		Satisfactory Condition(%)	Unsatisfactory Condition (%)
National Road	47,017	94	6
Provincial Road	45,644	72	28
Local Road	423,578	59	41
Total	510,419		

Road Length by Authority Portion



Data from : The Ministry of Public Works and Public Housing (2015)



# Introduction <sup>2</sup>

- The length of local roads in 2015 is 423.578 km with an average reliable road condition of 59%.
- Therefore, the government's efforts to improve local road satisfaction becomes very important.
- However, construction activities to improve it often have negative impacts, among other: an increase of user cost.



# Introduction <sup>3</sup>

User costs originate primarily from

- vehicle operating costs
- delay costs
- crash costs



# Introduction <sup>4</sup>

- vehicle operating costs (i.e., vehicle wear and tear, fuel consumption, repairs and maintenance),
- delay costs (e.g., from an increase in time required to travel between two points as a result of work zone or congestion), and
- crash costs (which are often a result of driver error and other factors not related to the roadway conditions and, as a result, are generally not factored in to life cycle cost analysis, LCCA)



# Introduction <sup>5</sup>

- user cost analysis is part of the total investment cost analysis
- Details concerning the computation of user costs can be found in the National Cooperation Highway Research Program
- Free software for computing these costs is part of the FHWA RealCost LCCA program



# Research design

- This study aims to evaluate the user costs that must be incurred for flexible and rigid pavement construction
- The design of flexible and rigid pavement thickness are based on component analysis method and manual pavement design 2012, respectively



# Research design <sup>2</sup>

- Two alternatives of design life are simulated for each type of pavement, namely a design life of 10 and 20 years
- User costs of those alternatives are analysed using Life cycle cost analysis program-RealCost 2.5
- This study was conducted based on cases local road construction





# Research design <sup>3</sup>

Primary and secondary data in this study include

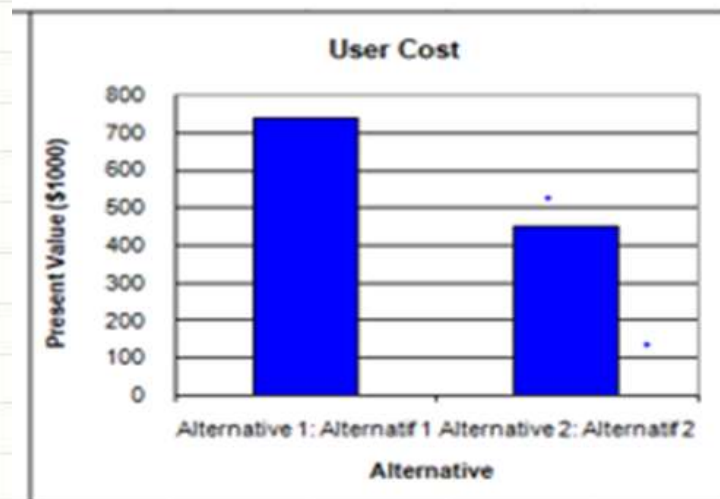
- project details, unit price of work, discount rate, volume of existing and planning road segment,
- traffic data, traffic hourly distribution, vehicle operating cost, value of user time, added time and vehicle stopping cost,
- work zone length, work zone duration, work zone speed limit, and lanes open in each direction during work zone



# Result and discussion

## Flexible Pavement

	Alternative 1 10 years' design life	Alternative 2 20 years' design life
Thickness of pavement	14,86 cm	18,86 cm
Budget plan	\$ 873,036,000	\$ 1,061,682,000
User cost	\$ 734,290	\$ 449,830





# Result and discussion <sup>2</sup>

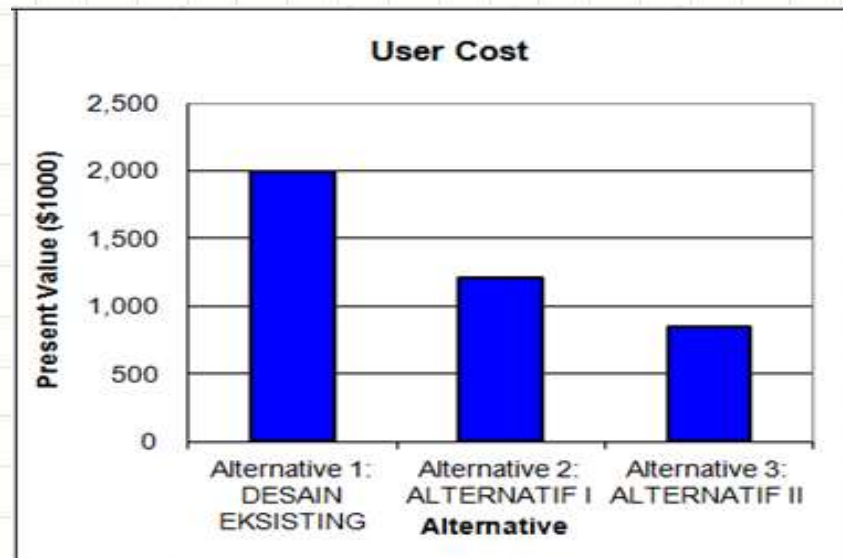
- Alternative 1 requires a higher user cost than alternative 2.
- For the design alternative with shorter design life, if the design life has been exceeded, the user cost of reconstruction will be calculated and then added to the total user cost, over an analysis period



# Result and discussion <sup>3</sup>

## Rigid Pavement

	Alternative 1 10 years' design life	Alternative 2 20 years' design life
Thickness of pavement	18 cm	20 cm
Budget plan	\$ 306,983	\$ 320,254
User cost	\$ 1,994,920	\$ 1,203,640





# Result and discussion <sup>4</sup>

- Alternative 1 requires a higher user cost than alternative 2.
- For the design alternative with shorter design life, if the design life has been exceeded, the user cost of reconstruction will be calculated and then added to the total user cost, over an analysis period
- The analysis period in this case means that this study compared the twenty-year life of design alternative 2 against a user cost of design alternative 1 plus user cost of reconstruction with design alternative 1 in ten years



# Conclusions

- User cost of flexible pavement construction of 10 years and 20 years' design life are US\$734,290 and US\$449,830 respectively,
- user cost of rigid pavement construction of 10 years and 20 years' design life are US\$1,994,920 and US\$1.203.640 respectively.
- Calculations using the LCCA method show that planning with a longer design life yields more economical value



**THANK YOU**

My email [fajarhani@gmail.com](mailto:fajarhani@gmail.com)