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THE IMPACT OF ROAD SURFACE CONDITION ON RURAL TRANSPORT SERVICES

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Topics



1. Background
2. Objectives and Motivation
3. Literature Review
4. Methodology
5. Results
6. Conclusions
7. Recommendations
8. Questions and Discussions





Background (Ethiopia Road Network)

Ethiopian Road Network

Road length by Surface Type	
Surface	Length
Paved	13,551
Unpaved	14,055
Total	27,606

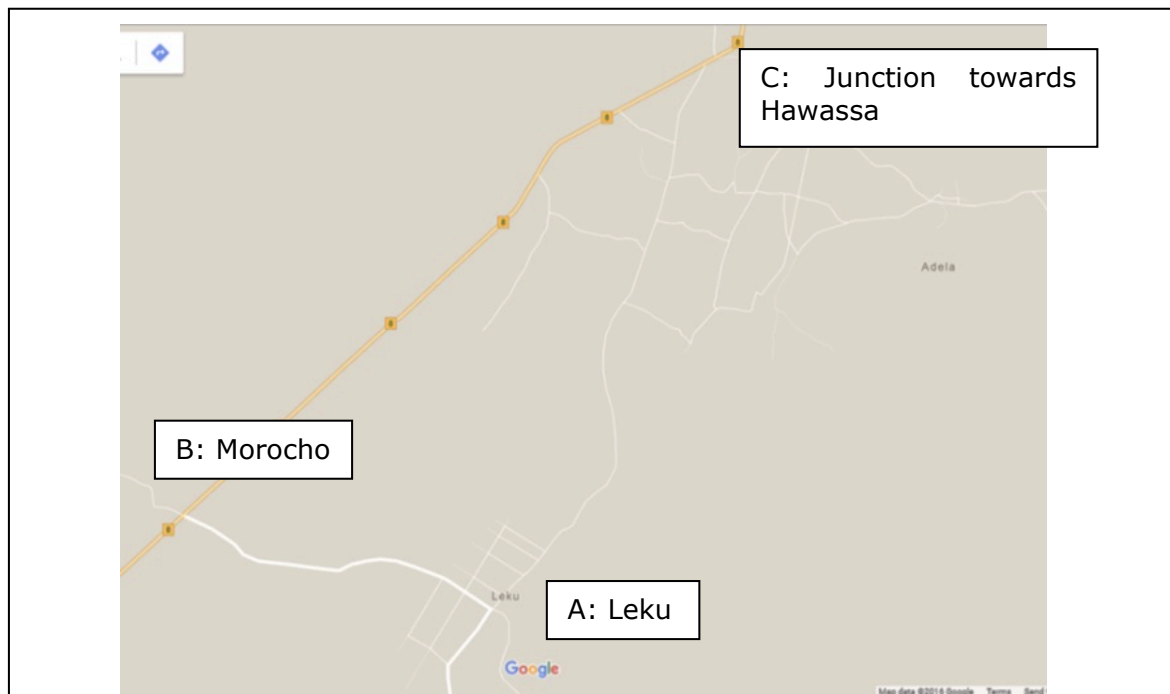
Road length by class	
Road Class	Length
Trunk	5,722
Link	7,791
Main Access	5,919
Collector	3,516
Feeder	4,658
Total	27,606

Location of project;

Southern part of Ethiopia, Near the City of Hawassa

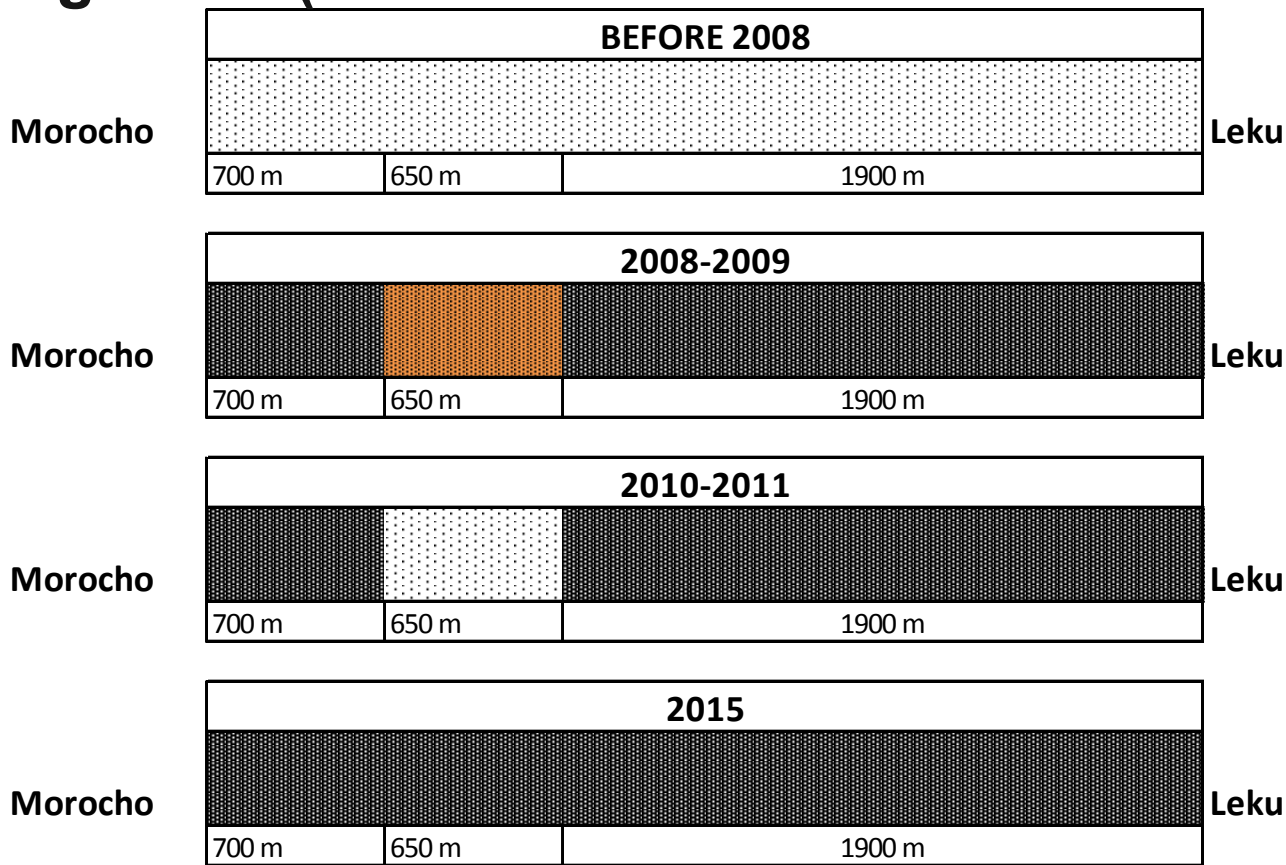


Background (Morocho – Leku Road Map)





Background (Morocho – Leku Road Schematic)





Background (Morocho – Leku Road 2011)





Background (Morocho – Leku Road 2015)





Objectives and Motivation



- 1. To propose the critical value of road surface condition that should be maintained to ensure a good mix of private providers of passenger transport services.**
- 2. To assess whether current road maintenance practices achieve the critical value of the road surface condition.**
- 3. To ascertain the primary factors that are required to attract private providers of passenger transport services for rural-urban routes (point of view of service providers).**



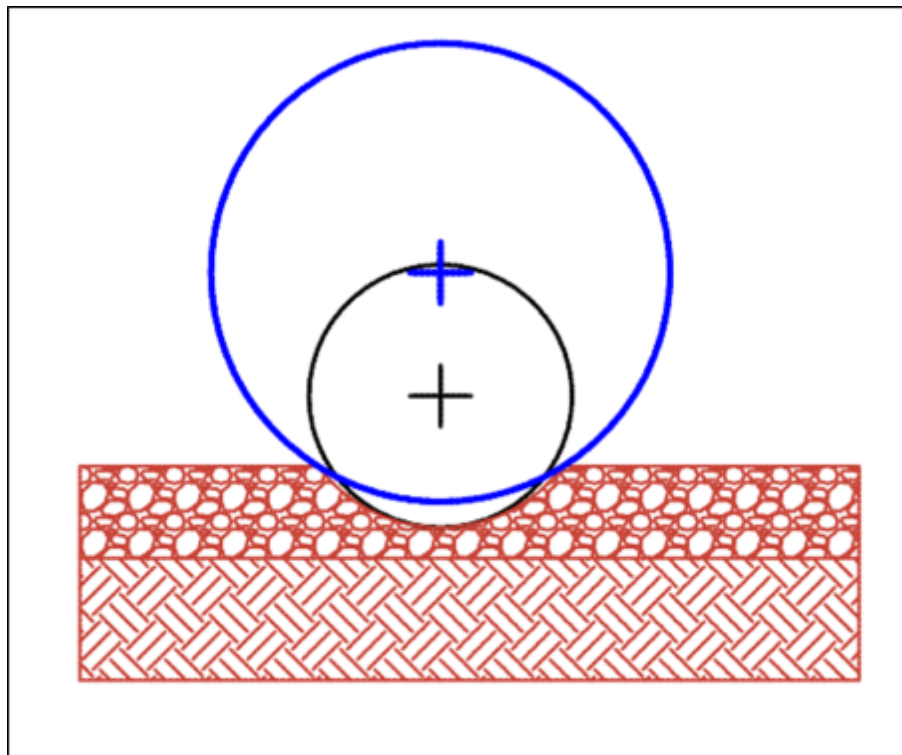
Literature Review

Roughness	Comment
1.5-3	Ride comfortable up to 120 km/h
4-6	Ride comfortable up to 100 km/h
7-8	Ride comfortable up to 70-90 km/h. strong perceptible movements. Occasional potholes
9-10	Ride comfortable up to 50-60 km/h. Sharp movements and swaying. Deep and uneven depressions, and frequent patches and potholes
>10	Necessary to reduce speed below 50 km/h. Deep depressions, potholes and severe disintegration.

Adopted from Sayers & et al, 1986



Literature Review – effect of roughness on different vehicle types





Literature Review

- Steyn et al (2015) – 29% tomatoes damaged on road of IRI 6 m/km at speeds of 30 km/h
- Poelman and Weir (1990) - Vehicle suspension fatigue damage at 1.5 PSI. Correa (1999) a value of 1.5PSI equates to IRI of about 7.4 m/km.
- Poelman and Weir (1990) further urge that: ‘road planners should be aware of the point at which the operator may experience significant damage.’
- Studies mainly on goods transport and heavy vehicles in South Africa. No suggested road condition values for passenger transport .



Methodology



1. Road roughness assessment on Morocho - Leku.
2. Traffic flow assessment on Morocho - Leku.
3. Interviews of passenger transport services providers on Morocho - Leku





Methodology



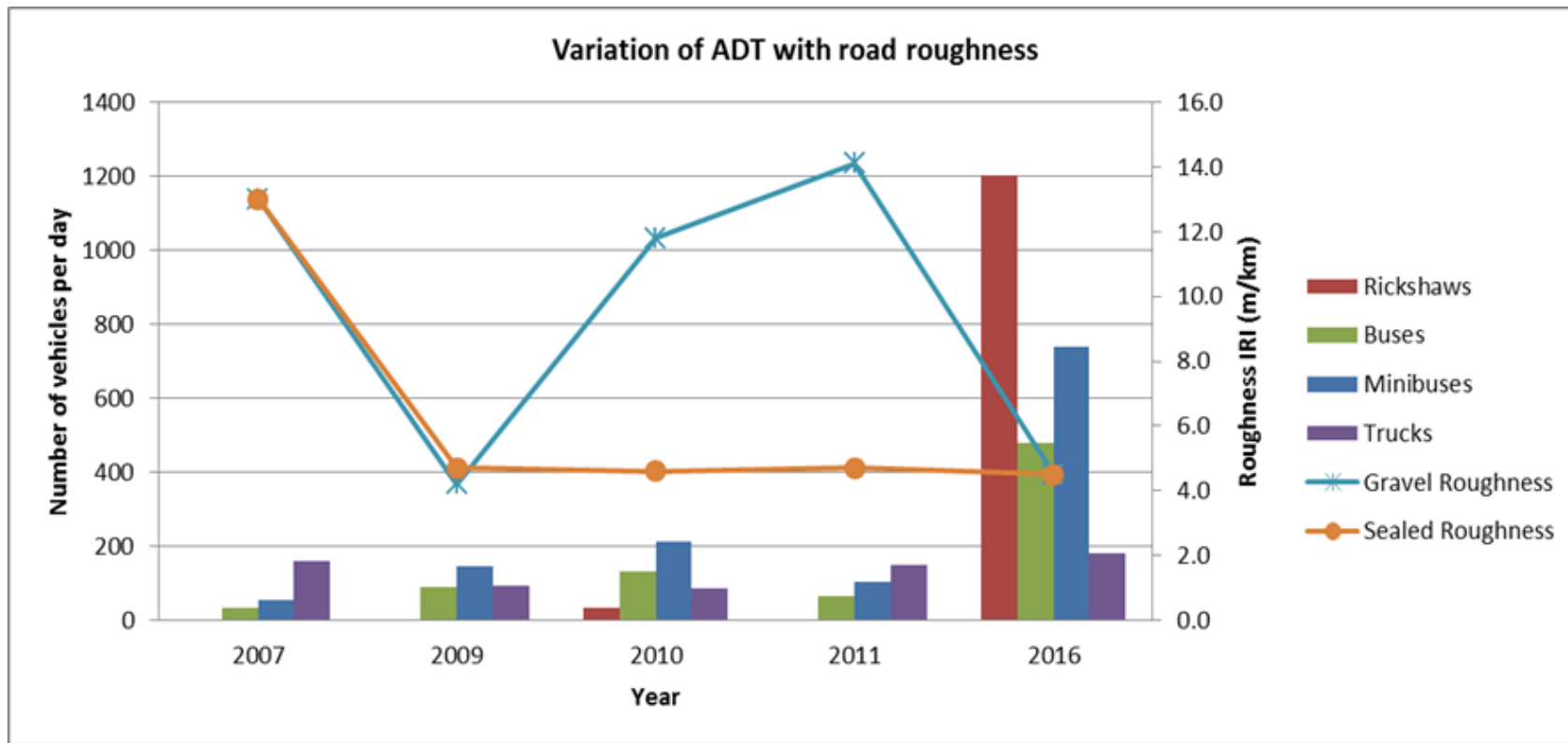


Methodology - Interviews





Results - Variation of ADT with road roughness





Result – Years in Operation



Vehicle Type	2016 Number of Drivers /Years Operating on Road				
	≤ 2	$2 < x < 5$	$5 < x < 8$	$8 < x < 11$	> 11
Rickshaws (Bajajs)	22	2	1	0	0
Minibus (Hiace)	3	8	1	0	0
Bus (Isuzu)	2	0	4	0	4

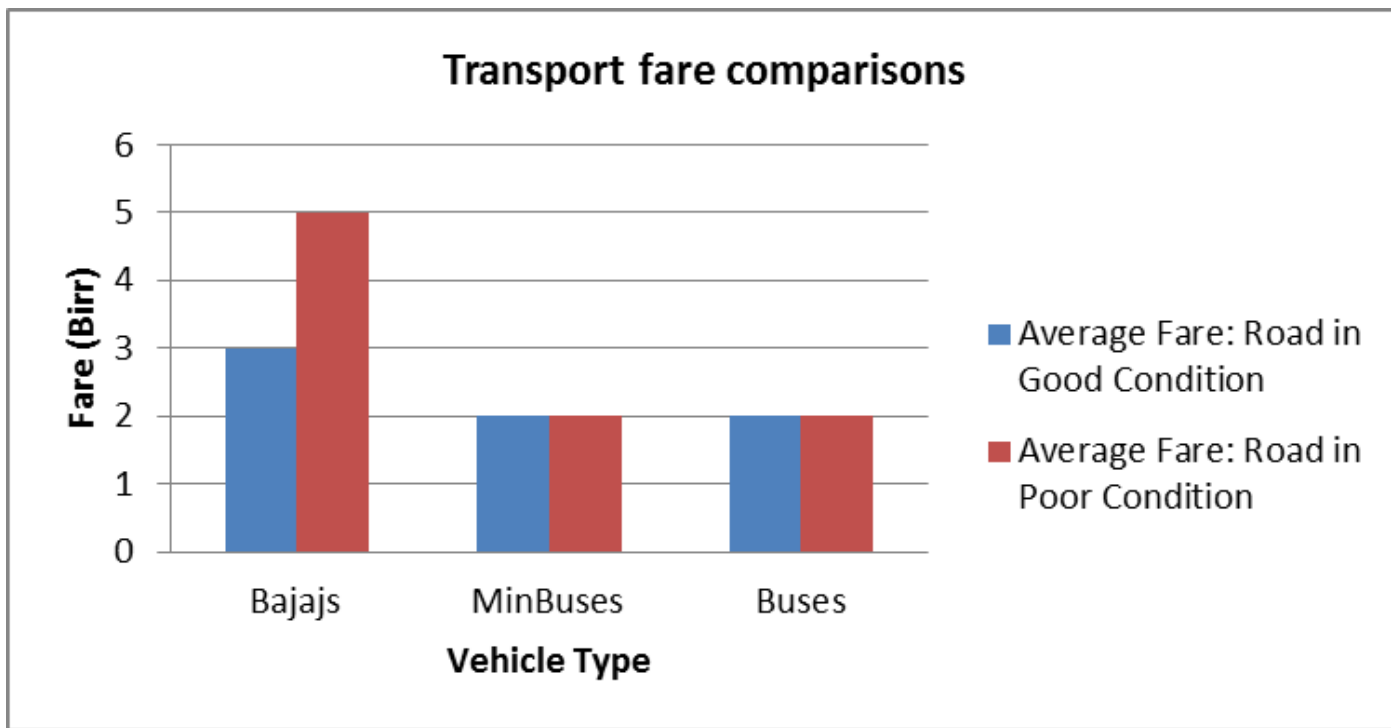


Results – Reasons for Route Selection

Reasons for being attracted to route	Number of times cited		
	Buses	Minibuses	Rickshaws
High number of passengers	6	4	16
Good quality road	7	4	16
Local resident	5	1	0
Trip is short (good speed)	2	4	0

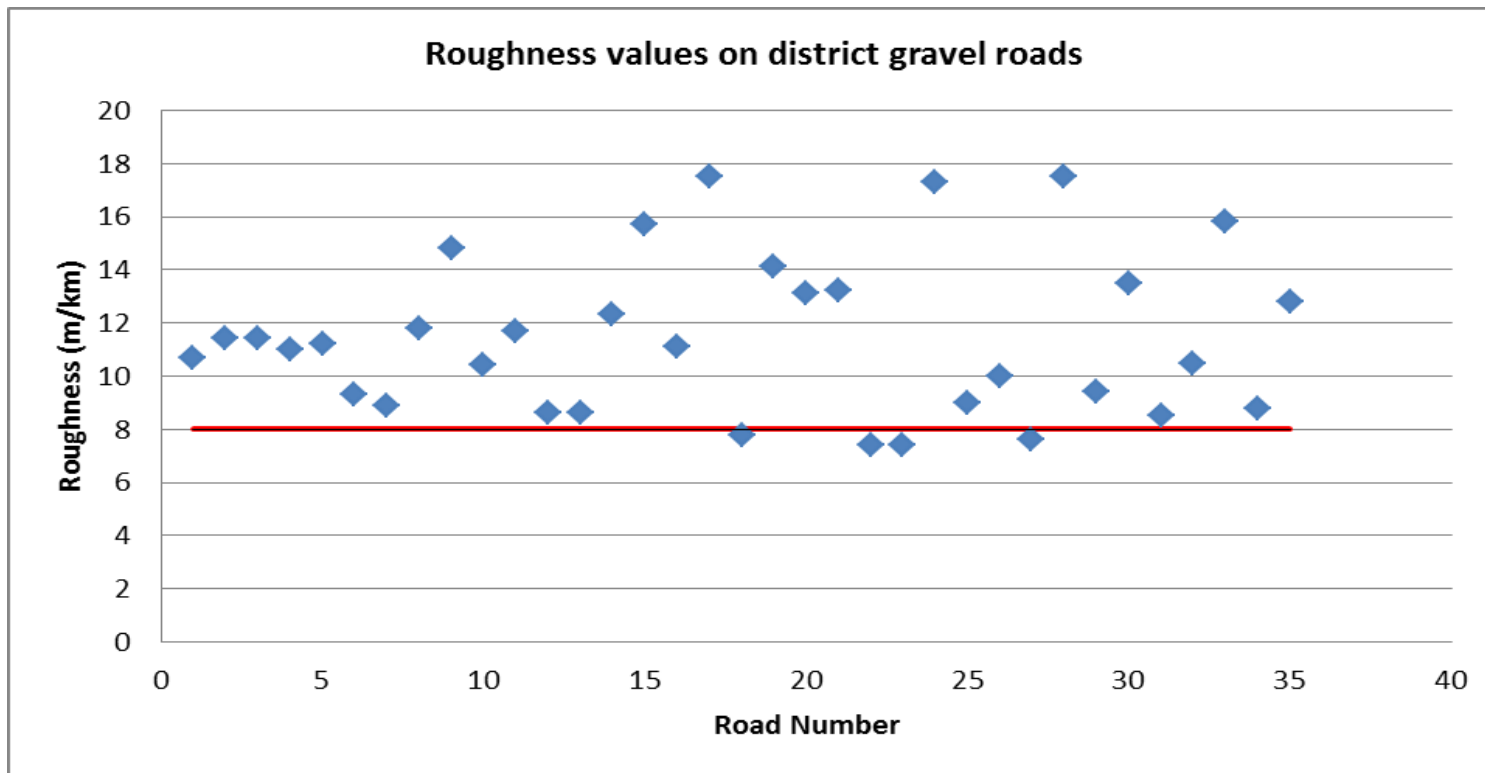


Results – Transport Fares





Further Discussions: Snapshot of Existing Road Condition



Data Obtained from Mukura 2008



Further Discussions: Sample Effect of Grading and Compaction



Roughness Before Grading (RI_{bg})	Roughness After Grading (RI_{ag})
6.0	4.5
7.0	5.2
8.0	5.9
9.0	6.6
10.0	7.3

Data Obtained from Mukura 2008





Conclusions

- **A critical value of road roughness of 8 m/km of has been proposed as the figure above which a significant fall in provision of transport services either by minibuses or by rickshaws begins to fall rapidly.**
- **A snapshot of gravel road conditions showed that the prevailing maintenance practice only ensured a very small number of roads met the proposed IRI critical value.**
- **Two critical factors were determined as vital to attracting a variety of private providers of transport services – good road condition and high population occurring at the same time.**



Recommendations



- **Combined strategy of selecting and upgrading roads yearly to better surface condition.**
- **Other critical roads should be identified and the condition kept at IRI less than the critical value through the year.**



Questions, discussions, and suggestions