#### REFERENCES

- 1. Central Bank of Sri Lanka, 2014. Economic and Social Statistics of Sri Lanka 2014, Colombo: Statistics Department.
- 2. Central Bank of Sri Lanka, 2016. Annual Report 2016, Colombo: s.n.
- 3. Transport Research Board, 2010. Highway Capacity Manual. Transportation Research Board, National Research Council, Washington, DC, 2010.
- 4. Directorate General of Highways, 1993. Indonesian Highway Capacity Manual. Jakarta: s.n.
- 5. Indian Roads Congress. Guidelines for Capacity of Roads in Rural Areas, New Delhi: Indian Roads Congress, 1990.
- 6. I.H. Hashim and T.A. Abdel-Wahed. Evaluation of performance measures for rural two-lane roads in Egypt. AEJ, 50, 2013, pp. 245-255.
- 7. Oregon Department of Transportation. Modelling Performance Indicators on Two Lane Rural Highways, Oregon DOT, Oregon, 2010.
- 8. C. Van As. The Development of an Analysis Method for the Determination of Level of Service of Two-lane Undivided Highways in South Africa. South African National Roads Agency Limited, 2003.
- 9. H.V LOSSR ,Level of Service for Heavy Vehicles on Rural Road survey publish through https://www.surveymonkey.com/s/HVLOSRR
- 10. D. Bews, Department of Indian Affairs and Northern Development, Transportation Division, Technical Services and Contracts branch, Ottawa, Ontario, Canada KIA OH4. G. Smith and G. Tencha, UMA Engineering Ltd., Development of Geometric design Standard for Low Volume Roads in Canada 1479 Buffalo Place, Winnipeg, Manitoba'CanadaR3TIL7,http://onlinepubs.trb.org/Onlinepubs/trr/1987/1106v2/1106 v2-027.pdf
- 11. Zegeer, C.V., R. Stewart, F. Council, and T.R. Neuman, Roadway Widths for Low-Traffic-Volume Roads, NCHRP Report 362, Transportation Research Board. Washington, D.C.:1994 http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp\_rpt\_362.pdf
- Tim Martin , Thorolf Thoresen and Ulysses ,ARRB Group, 'Estimating levels of service (LOS) for freight on rural roads', (Australasian Transport Research Forum 2016 ) 500 Burwood Hwy, Vermont South, Victoria, 3133 Email for correspondence: <u>tim.martin@arrb.com.au</u>.

# **APPENDIX 01**

# SAMPLE OF QUESTIONNAIRE REPRESENTING THREE

#### DISTRICT

	CRITERIA	FOR PEF		ANCE EVAL		JME ROADS
PART 'A'						
Province	Westem Pro	ovince			District	Colombo
EE Division	Colombo				Electrate	Kotte
D  B					Length	1.3
Road Name	Gangodavira	- Udanami	ulla		carnage way wroth	4.5
PART 'B'		BASIC DET	AILS		sugo	GESTION
Vehicle category	Heavy Vehic	: 0.128			Heavy vehicle or	Light vehicle
RDA classification	с				Class C	Class D
Vehicle Speed	Existing	Expected		averagetime (min)		
( km/hr.)	16			5		
Connectivity	Road Start	Main	road		Main rd or min or road	
	Road End	Main	road		Main rd, minor road or de	ead end
Traffic volume		per day				
Rating for this roo	nd.					
	% score					
Class A	75-100				In good and acceptable co	ondition
Class B	50-75	55			Satisfactory and Regular n	naintenance is enough
	0.75				Very poor condition and need	need more attention
	<u> </u>					
Ranking of criter	ia					
Criteria	Ranking according to effect	% weight for each criteria	Actual parame trs			
Road width	2	25	4.5		ranking should be most in	nportant criteria
Shoulder width	1	30	0.3		as no 1and others in asce	nding order
Narrow Bends	6	5	2			
Right of Way	з	20	3.2		Weightage should be as a	percentage of
Structures	7	2	High		importancy among the mo	ost important 5
Passing Bays	4	10	4		criterias	
_						
Road Fumiture	5	4	medium			
Road Fumiture Access to civic centers	5	4	medium 1			
	PART 'A'  Province  EE Division  EE Division  Road Name  PART 'B'  Vehicle category  Vehicle speed  Vehicle Speed  ( km /hr.)  Connectivity  Traffic volume  Rating for this row  Class A Class B Class C Class D  Ranking of criter  Criteria  Road width Shoulder width Narrow Bends  Right of Way Structures	PART 'A'CRITERIAPART 'A'ProvinceWestern ProvinceE DivisionColomboE DivisionColomboRoad NameGangodavilaPART 'B'Yehicle categoryHeavy VehicleRDA classificationCCIKm /hr.)I6Vehicle SpeedExistingConnectivityRoad StartRoad EndIRating for this rootIConnectivity% scoreClass A75-100Class B50-75Class C25-50Class D0-25Ranking of criteriaIRoad width2Shoulder width1Narrow Bends6Right of Way3Structures7	PART 'A'CRITERIA FOR PERPART 'A'IProvinceWestern ProvinceEDivisionColomboEDivisionGangodavila - UdahamaPART 'B'Kasic DEIPART 'B'IPART 'B'I </td <td>CRITERIA FOR PERFORMPART 'A'Vestem ProvinceProvinceWestem ProvinceEE DivisionColomboEE DivisionColomboPART 'B'BASIC DETTIONPART 'B'EASIC DETTIONPART 'B'ColomboVehicle categoryHeavy VehicRDA classificatiorCCImage: ColomboVehicle SpeedExistingKm /hr.)C16Image: ColomboVehicle SpeedExistingRoad EndMain - adRating for this rootImage: ColomboVehicle SpeedSooreConnectivityRoad StartMain FormerImage: ColomboVehicle SpeedSooreClass A75-100Class BSoor75Class C25-50Class DO - 25Class DO - 25Ranking of criteriaRanking for each oriteriaRanking of criteriaRanking for each oriteriaRanking of criteriaSooreCriteriaRanking for each oriteriaRoad width2Shoulder width1300.3Narrow Bends6502Structures72Uure</td> <td>CRITERIA FOR PERFORMANCE EVALUEPART 'A'ProvinceWestern ProvinceInc.ProvinceWestern ProvinceInc.EE DivisionColomboInc.PART 'B'Passi currentInc.PART 'B'Passi currentInc.Passi currentInc.Inc.PART 'B'Passi currentInc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Vehicle speedExistingExpectedInc.Italia for this rootInc.Inc.Ranking for this rootInc.Inc.Ranking of criteriaRanking for each currentActual parame currentRood width2Inc.Inc.Rood width2Inc.Rood width2Inc.Rood width2Inc.Rood width2Inc.Rood width2Inc.Rood width2Inc.Rood width2Rood widt</td> <td>CRITERIA FOR PERFORMANCE EVALUATION OF LOW VOLU         PART 'A'         Province       Westem Province       District         EE Division       Colombo       Electrate         Road Name       Gangodavila - Udahamulla       Electrate         Road Name       Gangodavila - Udahamulla       Length         Road Name       Gangodavila - Udahamulla       Length         Road Name       Gangodavila - Udahamulla       Class C         Vehicle category       Heavy Vehic       C.128       Main road         Vehicle speed       Existing       Expected       averagetime (min)         (km /hr.)       16       Jain road       Main road         Road Start       Main road       Main rd, minor road or de         Rating for this road       Ingood and acceptable co       Satisfactory and Regular more condition and needid class D         Rating of criteria       Ranking       % weight or for each parame tris       Actual parame tris         Road width       2       25       2       2       2         Road width       2       25       3       3       3         Rating of criteria       Ranking for each parame tris       4       4       4         Road width       2</td>	CRITERIA FOR PERFORMPART 'A'Vestem ProvinceProvinceWestem ProvinceEE DivisionColomboEE DivisionColomboPART 'B'BASIC DETTIONPART 'B'EASIC DETTIONPART 'B'ColomboVehicle categoryHeavy VehicRDA classificatiorCCImage: ColomboVehicle SpeedExistingKm /hr.)C16Image: ColomboVehicle SpeedExistingRoad EndMain - adRating for this rootImage: ColomboVehicle SpeedSooreConnectivityRoad StartMain FormerImage: ColomboVehicle SpeedSooreClass A75-100Class BSoor75Class C25-50Class DO - 25Class DO - 25Ranking of criteriaRanking for each oriteriaRanking of criteriaRanking for each oriteriaRanking of criteriaSooreCriteriaRanking for each oriteriaRoad width2Shoulder width1300.3Narrow Bends6502Structures72Uure	CRITERIA FOR PERFORMANCE EVALUEPART 'A'ProvinceWestern ProvinceInc.ProvinceWestern ProvinceInc.EE DivisionColomboInc.PART 'B'Passi currentInc.PART 'B'Passi currentInc.Passi currentInc.Inc.PART 'B'Passi currentInc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Passi currentInc.Inc.Vehicle speedExistingExpectedInc.Italia for this rootInc.Inc.Ranking for this rootInc.Inc.Ranking of criteriaRanking for each currentActual parame currentRood width2Inc.Inc.Rood width2Inc.Rood width2Inc.Rood width2Inc.Rood width2Inc.Rood width2Inc.Rood width2Inc.Rood width2Rood widt	CRITERIA FOR PERFORMANCE EVALUATION OF LOW VOLU         PART 'A'         Province       Westem Province       District         EE Division       Colombo       Electrate         Road Name       Gangodavila - Udahamulla       Electrate         Road Name       Gangodavila - Udahamulla       Length         Road Name       Gangodavila - Udahamulla       Length         Road Name       Gangodavila - Udahamulla       Class C         Vehicle category       Heavy Vehic       C.128       Main road         Vehicle speed       Existing       Expected       averagetime (min)         (km /hr.)       16       Jain road       Main road         Road Start       Main road       Main rd, minor road or de         Rating for this road       Ingood and acceptable co       Satisfactory and Regular more condition and needid class D         Rating of criteria       Ranking       % weight or for each parame tris       Actual parame tris         Road width       2       25       2       2       2         Road width       2       25       3       3       3         Rating of criteria       Ranking for each parame tris       4       4       4         Road width       2

#### 1. Gangodavila – Udahamulla Road in Colombo district

	PART 'C'	CRITERIA EV/		J		SUGGE	STION	
_	<u></u>	CRITERIAL	RECATION	<u>u</u>				
	Rood width							
-	Kuau wiutii							
		Current	Low	Medium	High	upto 3.5m	low	
		condition		×		Botwoon 25 40m	medium	4.5
-						abovo 40m	High	
						4,011	Ingh	
2	Shoulder width	Current	Low	Medium	High	upto 0.6m	low	
		condition	×			Between 0.6-1.0m	mediam	0.3
						above 1.0m	High	
		●. Shoulder	Width rea	quired for su	udden parking.			
		For the safet	y of pede	estrian and o	drivers			
		•.Shoulder \	Nidth is d	epend on t	he type of			
-		vehicle.	- : -!:		:			
		•. when con	isidering Inciderth	expected w	rath, it			
		and type of y	vehicle Ca	ategory	speed			
з	Narrow Bends							
	( Visibility)	Current	Low	Medium	High	above 6No/km	low	
		condition			×	Between 3-6No/km	medium	2
						upto 3 No/km	High	
		If There is m	ore Bend	s are in the	road,			
		Its effecting	tothe					
		<ul> <li>Driving co</li> </ul>	omfortabi	lity				
-		Reduce th     Cause for	accident					
		•. causeror	accident					
4	Right of Way						from centerline	
		Current	Low	Medium	High	up to 3.0m	low	
		condition		×		Between 3.0 - 5.0m	medium	3, 2
						above 5.0m	High	
		If There is no	ot enough	i space to in	nprove Road			
		Then need R	oad side	Acquisition	and caurse			
-		high expend	iture					
5	Structures							
		Current	Low	Medium	High	Existing structures are	Low	
		condition			x	streamly not enough There some structures but		
		• Extension	of culver	+		not enough for proper	medium	High
		Required	new Culv	ert		maintain		ingn.
		•. Required	new Reta	ining Walls	and toe walls	Existing structures are enou		
		•. Required	concrete	drains	intercer many	but no full fill requirement	High	
		•. Required	more Ear	th drains				

6 Passing Bays							
	Current	Low	Medium	High	up to 3 No/km	Low	
	condition		x		Between 3-6No/km	medium	4
					above 6 No /km	High	
	•. Since the	Road is n	arrow, it is	required to			
	provide pass	sing bays	to pass ve	hicle and			
	overtake.			-			
	•. Even thou	gh wider	n the road,	it is required			
	-to provide	passing B	Bays and Bu	is bays .			
7 Road Furniture							
, noud furniture		Low	Medium	High	Edge line and nedestrian	low	
	Current	LOW	Incurum	ing.	Luge inte and pedeschan	LOW	
	condition		X		only		
					Edge line, pedestrian	medium	mediun
	Road furnitu	re			and sign boards		1
	•. Edge Line	and Pede	estrian		Edge line, pedestrian	High	
	•. Sign Board	ds			and sign boards, street		
	•. Street ligh	nts			lighting		
8 Access to civic							
centers	Current	Low	Medium	High	upto 1No	Low	
	condition	×			Between 2-3No	medium	1
					above 3 No	High	
	Intended civ	iccenter	s are				
	<ul> <li>School</li> </ul>						
	•. Hospital						
	•. Main tem	ples					
	•. Governme	ent organ	izations				
		_					

		CDITEDIA					
		CRITERIA	FORPER		ANCE EVALU		VIE ROADS
	PART'A'						
	Province	Western Pro	vince			District	Kaluthara
	EE Division	Kaluthara				Electrate	Bandaragama
	Read Name	Katholowol	Alathiyou			Length	2.4
	Nuau Naine	Kothalawai -	Alochiyaw	a		camage way which	5.0
	PART 'B'		BASIC DET	AILS	· · · ·	SUGGE	STION
А	Vahiala	Heavy Vehic	0.044			Heavy vehide or	Light vehicle
	composition						
	F	Light Vehide	2				
_							
в	RDA classification	D				Class C	Class D
_				1	averagetime		
в	Vehicle Speed	Existing	Expected		(min)		
	(km/hr.)	14			10		
					12		
С	Connectivity	Road Start	Main	road		Main rd or minor road	
		Road End	Main I	Road	-	Main rd , minor road or dead end	
-	Traffic yelum e		par dou				
	Trainc volume		perday				
e	Rating for this roo	ad					
		% score					
	Class A	75-100				In good and acceptable con-	dition
_	Class B	50-75	50			Satisfactory and Regular ma	intenance is enough
		<u></u>	50			Vary paar condition and need in	ad mara attantian
		0-20				very poor condition and he	
f	Ranking of criter	ia					
		Ranking 	% weight	Actual			
	Criteria	according	for each criteria	parame			
1	Road width	1	23				
	Shoulder width		20	3.8		ranking should be most imp	ortant often a
2	Narrow Bends	5	10			as no land others in ascend	ang order
4	Right of Way	2	16	3			
4	Structures	3	01	3.5		Weightage should be as a p	ercentage of
5	Passing Bays	0	9	medium		importancy among the mos	t important 5
6	Paod Euroiteuro	4	14	3		criterias	
7	Road Furniture	7	5	medium			
8	Access to civic centers	8	3	1			
9	Railway crossing	9	0				
			100				

#### 2.0 Kothalwala – Alothiyawa Road in Kaluthara District

	PART 'C'	CRITERIA EV		J		SUGGESTION			
1	Road width								
-									
		Current	Low	Medium	High	up to 3.5m	low		
		condition	×			Between 2.5 - 1.0m	medium	3.8	
-						above / 0m	High		
_						4,011	ingn	1	
2	Shoulder width	Current	Low	Medium	High	upto 0.6m	low		
		condition		×		Between 0.6-1.0m	mediam	1	
						above 1.0m	High		
		•. Shoulder	Width rec	uired for s	udden parking.				
		For the safet	y of pede	strian and	drivers				
		●.Shoulder\	Width is d	epend on	the type of				
		vehicle.							
		<ul> <li>When con</li> </ul>	sidering	expected v	vidth, it				
		should be co	nsider th	e expected	d speed				
		and type of	/enicie La	itegory					
⊢									
2	Narrow Bondr								
-	(Vicibility)	Current	Low	Medium	High	ahove 6 No./km	low		
	(visionity)	condition	L0 W		Ingi	Botwoon 2 CNo/km	medium		
		oonaltion				un to 3 No/km	High		
		If There is m	ore Bend	s are in the	road.		1.1.8.1		
		Its effecting	to the						
		●. Driving co	omfortabi	lity					
		•. Reduce th	e speed						
		<ul> <li>Cause for</li> </ul>	accident						
								_	
4	Right of Way						from centerline		
		Current	Low	Medium	High	upto 3.0m	low		
		condition		×		Between 3.0 - 5.0m	medium	3.5	
		lé Thana ia an			n n n n n n n n n n n n	above 5.Um	High		
		Thop pood P	ot enougn ood cido	space to i	mprove Road				
		high expend	iture	Acquisition	ranu caurse				
		ingi expense							
5	Structures								
		Current	Low	Medium	High	Existing structures are	Low		
-		condition		×		There some structures but			
		•.Extension	of culvert			not enough for proper	medium	mediu	
		Required	new Culv	ert		maintain		m	
		•. Required	new Reta	ining Wall-	s and toe walls	Existing structures are enou			
		•. Required	concrete	drains		but no full fill requirement	High		
		•. Required	m ore Eart	h drains				1	

6 Passing Bays							
	Current	Low	Medium	High	up to 3 No/km	Low	
	condition	×			Between 3-6No/km	medium	3
					above 6 No / km	High	
	•. Since the f	Road is n	arrow, it is n	equired to			
	provide pass	sing bays	to pass vehi	icle and			
	overtake.						
	•. Even thou	gh wider	the road, it	is required			
	-to provide p	bassing B	ays and Bus	bays .			
7 Road Furniture							
, noud runneare		LOW.	Medium	High	Edge line and nedestrian	LOW.	
	Current condition	2011	X	111811	only	1011	
					Edge line, pedestrian	medium	mediu
	Road furnitu	re			and sign boards		
	•. Edge Line	and Pede	estrian		Edge line, pedestrian	High	
	•. Sign Board	s			and sign boards, street		
	•. Street ligh	ts			lighting		
8 Access to civic							
centers	Current	Low	Medium	High	up to 1 No	Low	
	condition	×			Between 2-3No	medium	1
					above 3 No	High	
	Intended civi	ic center	sare				
	•. School						
	•. Hospital						
	•. Main temp	oles					
	•. Governme	nt organ	izations				

		CRITERIA	FOR PER		ANCE EVAL		VIEROADS
	PART 'A'						
	Province	Western Pro	vince			District	Gampaha
	EE Division	Nittambuwa	3			Electrate	Meerigama
	Read Name	Kongosdoniu	ia Mallah			Length	4.7
	Kuau Maine	Kongasuenn	/a - iviairani	dwa		Carnage way which	4
	PART 'B'		BASICDET	AILS		sugge	STION
				-			
А	Vehicle	Heavy Vehic	0.02			Heavy vehicle or	Light vehi de
	composition	1 :=   + 1 + -   -   -	~				
		Light vehicle	90				
в	RDA classification	D				Class C	Class D
				-			
в	Vehicle Speed	Existing	Expected		averagetime (min)		
	(km/hr.)	24			12		
	(,						
с	Connectivity	Road Start	Main	road		Main rd or minor road	
		Road End	Main	road		Main rd, minor road or dead end	
А	Traffic volumo		ner dav				
			perday				
e	<u>Rating for this roo</u>	<u>ıd</u>					
	-	% score					
	Class A	75-100				In good and acceptable con	dition
	Class B	50-75				Satisfactory and Regular ma	aintenance is enough
	Class C	25 - 50	45			poor condition and need in	provement
	Class D	0-25				Very poor condition and ne	ed more attention
f	Ranking of criter	a					
		Ranking	% weight	Actual			
	Criteria	according	for each	parame			
	n	to effect	criteria	trs			
1	koaorwiotth	2	19	4		ranking should be most imp	portant oriteria
2	snoulder width	1	26	0.6		as no 1 and others in ascen	ding order
3	Narrow Bends	4	15	З			
4	Right of Way	5	10	4		Weightage should be as a p	ercentage of
5	Structures	6	7	medium		importancy among the mos	t important 5
6	Passing Bays	З	17	2		criterias	
7	Road Furniture	7	5	Low			
8	Access to divid centers	8	1	1			
9	Railway crossing	9	O				
			100				

#### 3.0 Kongasdeniya – Mallahawa Road in Gampaha District

	PART 'C'	CRITERIA EV/	ALUATION			SUGGESTION			
1	Road width								
			1		11:-1-		1 m m		
		Current	LOW	Ivieaium	High	upto 3.5m	IOW		
		condition		×		Between 3.5 - 4.0m	medium	4	
						above 4.0m	High		
2	Shoulder width	Current	Low	Medium	High	upto 0.6m	low		
		condition	×			Between 0.6-1.0m	mediam	0.6	
		• Shouldor	Width roa	uirod for	cuddon narking	above 1.Um	High		
		For the safet	widthied ty of nede	strian and	drivers				
		•.Shoulder \	Width is de	epend on	the type of				
		vehicle.							
		•. When cor	nsideringe	xpected v	width, it				
		should be co	nsiderthe	expecte	d speed				
		and type of v	vehicle Cat	egory					
-									
	Navyay Panda								
3	Narrow benus	Current	Low	Madium	High	shave ENa/km	low		
		condition	LUW		nigii	Botwoon 2 (No/km	medium	3	
				^		unto 3 No/km	High	5	
		If There is m	ore Bends	are in the	e road.		10.60		
		Its effecting	tothe						
		•. Driving co	omfortabil	ity					
		•. Reduce th	ne speed						
_		•. Cause for	accident						
4							from contarline		
4	Kight of Way	Current	Low	Medium	High	unto 30m	low		
		condition	2000	x	Thigh	Between 3.0 - 5.0m	medium	4	
				~		above 5.0m	High		
		If There is no	ot enough	space to i	mprove Road				
		Then need R	oad side A	cquisitio	n and caurse				
		high expend	iture						
5	Structures								
_		Current	Low	Medium	High	Existing structures are	1		
		condition		x		streamly not enough	LOW		
						There some structures but		mediu	
		• Extension	of culvert			not enough for proper	medium	m	
		Required	new Culve	ert		maintain			
-		Required	new Ketai	ning Wall Iraing	s and toe walls	Existing structures are enought to full fill requirement	High		
		Required	more Fort	n anns a draine		sachoran in requirement			
		nequireu	more cart	rurallis					

6 Passing Bays							
	Current	wal	Medium	High	upto 3 No/km	Low	
	condition	x			Between 3-6No/km	medium	2
					above 6No/km	High	
	•. Since the	Ro <mark>ad</mark> is n	arrow, it is	required to			
	provide pass	ing bays	to pass veh	icle and			
	overtake.						
	•.Eventhou	gh wide r	n the ro <mark>ad</mark> , i	t is required			
	-to provide p	bassing B	ays and Bus	s bays .			
7 Road Euroituro							
		low	Madium	Lish	Edge line and redestrian	low	
	Current	ШW	meatum	nigii	cage line and pedestrian	LOW	
	condition	Х			only		
					Edge line, pedestrian	medium	Low
	Road furnitu	re			and sign boards		
	•. Edge Line	and Pede	estrian		Edge line, pedestrian	High	
	•. Sign Board	s			and sign boards, street		
	•. Street ligh	ts			lighting		
8 Access to civic							
centers	Current	low	Medium	High	upto 1No	Low	
	condition	X			Between 2-3No	medium	1
					above 3 No	High	
	Intended civ	ic center	sare				
	School						
	•. Hospital						
	•. Main tem	oles					
	•. Governme	nt organ	izations				
		-					

# **APPENDIX 02**

### PHOTOS INDICATING NATURE OF PROVINCIAL ROADS

