

Appendix 6 Intersection Analysis

APPENDIX 6 INTERSECTION ANALYSIS

Intersection analysis sheet are shown in the following pages as attached materials of Chapter 4 MID TERM SOLUTION.

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- I-2. Intersection Analysis Sheet
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 - 1.2 Tinkune Signalized Intersection (2030: Without case) Current Lane Arrangement
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I-1. Summary Table of Intersection Analyses

The result of intersection analyses (year-2030) summary are shown below.

Table 6.1 Summary Table of Signalized Intersection Analyses (1/8)

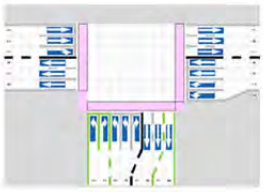

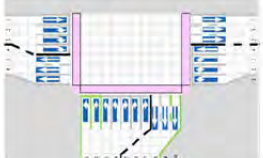
Name of Intersection	Name of Option	Type of Intersection	Lane Arrangement	Result/Evaluation of Signalized/Roundabout Intersection Analysis			Remarks Inflow lane arrangement	Lane arrangement of Intersection	Sheet No.
				Cycle Time	Saturation Degree	Evaluation			
Koteshwor	Without Case	Signalized 3 legs intersection	Current condition	180	2.14	NG (>0.90)	Cannot processing traffic volume of SB/NB/EB left turn lanes		1.1
Koteshwor	With Case Option 4	Signalized 3 legs intersection	Additional lane arrangement	120	0.91	Almost good	Slight traffic congestion will be occurred at the NB left turn lane.		1.3
				SB: 4 lns, NB: 6 lns and EB: 7 lns inflow lanes Total: 17 lns					
Koteshwor	With Case Option 5	Signalized 3 legs intersection	Additional lane arrangement	180	0.79	Excellent	Slight traffic congestion will be occurred at the NB/EB left turn lanes.		1.5
				SB: 4 lns, NB: 4 lns and EB: 7 lns inflow lanes Total: 15 lns					

Table 6.2 Summary Table of Signalized Intersection Analyses (2/8)

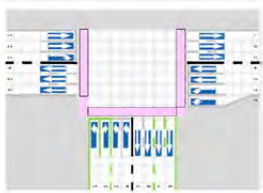


Name of Intersection	Name of Option	Type of Intersection	Lane Arrangement	Result/Evaluation of Signalized/Roundabout Intersection Analysis			Remarks Inflow lane arrangement	Lane arrangement of Intersection	Sheet No.
				Cycle Time	Saturation Degree	Evaluation			
Koteshwor	Without Case /2020	Signalized 3 legs intersection	Current condition	120	1.78	NG (>0.90)	During peak hour, a heavy congestion occurs at the NB left turn lanes		1.7
Tinkune	Without Case	Signalized 3 legs intersection	Current condition	120	1.15	NG (>0.90)	Traffic congestion will be occurred at the NB left turn lane.		1.2
				SB: 3 lns, NB: 4 lns and EB: 3 lns inflow lanes Total: 10 lns					
Tinkune	With Case Option 4	Signalized 3 legs intersection	Additional lane arrangement	120	0.70	Excellent	Traffic volume can be processing at all inflows.		1.4

Table 6.3 Summary Table of Signalized Intersection Analyses (3/8)


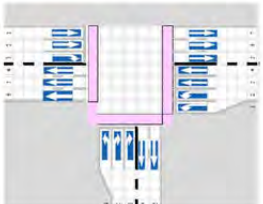



Name of Intersection	Name of Option	Type of Intersection	Lane Arrangement	Result/Evaluation of Signalized/Roundabout Intersection Analysis			Remarks Inflow lane arrangement	Lane arrangement of Intersection	Sheet No.
				Cycle Time	Saturation Degree	Evaluation			
Tinkune	With Case Option 5	Signalized 3 legs intersection	Additional lane arrangement	120	0.59	Excellent	Traffic volume can be processing at all inflows.		1.6
				SB: 3 lns. NB: 3 lns and EB: 2 lns inflow lanes Total: 8 lns					
Tinkune	Without Case /2020	Signalized 3 legs intersection	Current condition	100	0.72	Excellent	Traffic volume can be processing at all inflows.		1.8
Tinkune (year 2020) Existing condition of intersections	Tinkune North	Non-signalized 3 legs intersection	Current condition	(60)	0.07	Good	Traffic volume can be processing at all inflows.		-
	Tinkune West			(60)	0.82				-
	Tinkune South			(60)	0.55				-

Table 6.4 Summary Table of Signalized Intersection Analyses (4/8)

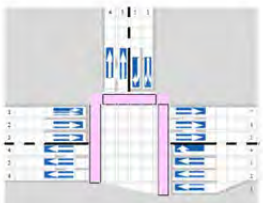


Name of Intersection	Name of Option	Type of Intersection	Lane Arrangement	Result/Evaluation of Signalized/Roundabout Intersection Analysis			Remarks Inflow lane arrangement	Lane arrangement of Intersection	Sheet No.
				Cycle Time	Saturation Degree	Evaluation			
Jadibuti	With case (Option 4/5)	Signalized 3 legs intersection	Current condition	70	1.13	NG (≤ 0.90)	Cannot processing traffic volume of EB-WB through lanes.		2.1
				SB: 2 lns. EB: 3 lns and WB: 4 lns inflow lanes Total: 9 lns					
Jadibuti	With case (Option 4/5)	Signalized 3 legs intersection	Additional lane arrangement	70	0.92	Almost good	Slight traffic congestion will be occurred, but it can be processing.		2.2
				SB: 2 lns. EB: 4 lns and WB: 5 lns inflow lanes Total: 11 lns					
New Baneshwor	Without Case	Signalized 4 legs intersection	Current condition	70	0.81	Good	SB: 2 lns. EB: 4 lns. NB: 2 and WB: 4 lns inflow lanes Total: 10 lns		3.1

Table 6.5 Summary Table of Signalized Intersection Analyses (5/8)

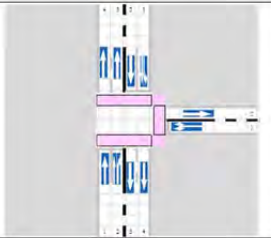
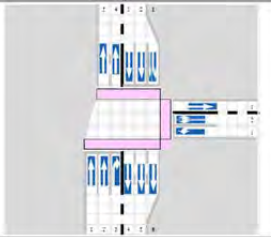
Name of Intersection	Name of Option	Type of Intersection	Lane Arrangement	Result/Evaluation of Signalized/Roundabout Intersection Analysis			Remarks Inflow lane arrangement	Lane arrangement of Intersection	Sheet No.
				Cycle Time	Saturation Degree	Evaluation			
Maitighar (North)	Without Case	Signalized 3 legs intersection	Current condition	120	1.04	NG (>0.90)	Cannot processing traffic volume of NB right turn lane		4.1
Maitighar (North)	Without Case	Signalized 3 legs intersection	Additional lane arrangement	120	0.62	Excellent	Can processing traffic volume of NB right turn lane		4.2
				Additional Lanes: SB: 1 ln. WB: 1 ln and NB: 1 ln					

Table 6.6 Summary Table of Signalized Intersection Analyses (6/8)

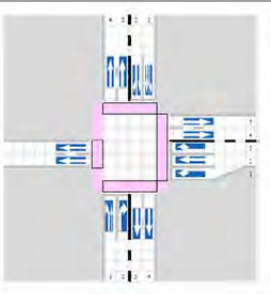
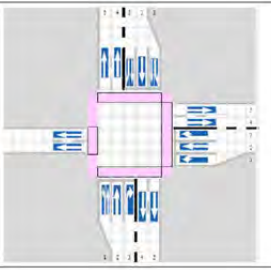

Name of Intersection	Name of Option	Type of Intersection	Lane Arrangement	Result/Evaluation of Signalized/Roundabout Intersection Analysis			Remarks Inflow lane arrangement	Lane arrangement of Intersection	Sheet No.	
				Cycle Time	Saturation Degree	Evaluation				
Maitighar (South)	Without Case	Signalized 4 legs (WB: Outflow) intersection	Current condition	120	1.27	NG (>0.90)	Cannot processing traffic volume of inflow lanes		5.1	
Maitighar (South)	Without Case	Signalized 4 legs (WB: Outflow) intersection	Additional lane arrangement	120	0.76	Excellent	Can processing entire traffic volume		5.2	
				Additional Lanes: SB: 1 ln and NB: 1 ln						
Maitighar (South)	Without Case	Roundabout	Current condition	LOS F		No Good	Cannot processing traffic volume of inflow lanes		5.3	
				WB	SB	EB	NB			LOS _{INTERSECTION}
				505 F	103 F	-	735 F			532 F

Table 6.7 Summary Table of Signalized Intersection Analyses (7/8)

Name of Intersection	Name of Option	Type of Intersection	Lane Arrangement	Result/Evaluation of Signalized/Roundabout Intersection Analysis			Remarks Inflow lane arrangement	Lane arrangement of Intersection	Sheet No.
				Cycle Time	Saturation Degree	Evaluation			
Thapathali	Without Case	Signalized 4 legs intersection	Current condition	120	1.12	NG (>0.90)	Cannot processing traffic volume of NB left turn and EB right turn lanes		6.1
Thapathali	Without Case	Signalized 4 legs intersection	Additional lane arrangement	120	0.61	Excellent	Can processing entire traffic volume		6.2
				Additional Lanes: SB: 1 ln. NB: 1 ln and EB: 1 ln					

Table 6.8 Summary Table of Signalized Intersection Analyses (8/8)

Name of Intersection	Name of Option	Type of Intersection	Lane Arrangement	Result/Evaluation of Signalized/Roundabout Intersection Analysis			Remarks Inflow lane arrangement	Lane arrangement of Intersection	Sheet No.		
				Cycle Time	Saturation Degree	Evaluation					
Tripureshwor	Without Case	Signalized 4 legs intersection	Current condition	120	1.32	NG (>0.90)	Cannot processing traffic volume of SB right turn lane		7.1		
Tripureshwor	Without Case	Signalized 4 legs intersection	Additional lane arrangement	120	0.90	Good	Can processing traffic volume of SB right turn lane		7.2		
				Additional Lanes: SB: 1 ln. NB: 1 ln and EB: 1 ln							
Tripureshwor	Without Case	Roundabout	Current condition	LOS F		No Good	Cannot processing traffic volume of inflow lanes		7.3		
				WB	SB	EB	NB			LOS _{intersection}	Inflow section
				33 D	656 F	84 F	311 F			427 F	Average Control Delay (second/veh.) and LOS

I-2. Intersection Analysis Sheet

1.1 Koteswhor Signalized Intersection (2030: Without case) Current Lane Arrangement

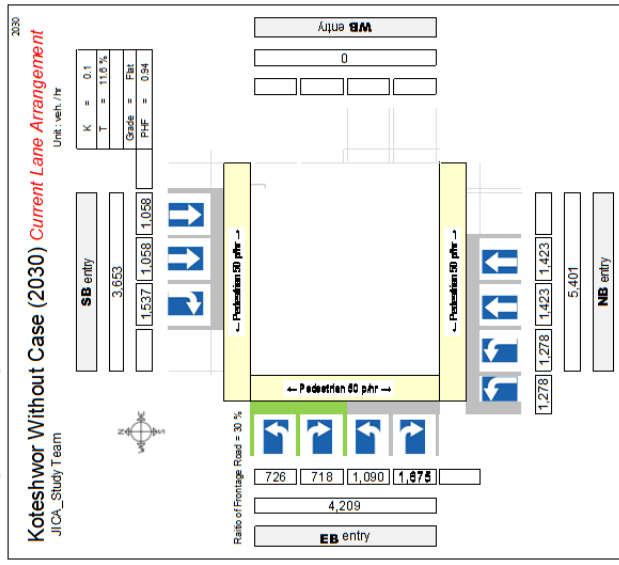
Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

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Calculation result of Intersections (Koteswhor Intersection) **Current Lane Arrangement**

Name of intersection	Koteswhor Without case			
Target year	2030_peakhour	180	40	30
		1φ	2φ	3φ
		4φ	3φ	4φ
		5φ	6φ	7φ
		8φ	9φ	10φ
		11φ	12φ	13φ
		14φ	15φ	16φ
		17φ	18φ	19φ
		20φ	21φ	22φ
		23φ	24φ	25φ
		26φ	27φ	28φ
		29φ	30φ	31φ
		32φ	33φ	34φ
		35φ	36φ	37φ
		38φ	39φ	40φ
		41φ	42φ	43φ
		44φ	45φ	46φ
		47φ	48φ	49φ
		50φ	51φ	52φ
		53φ	54φ	55φ
		56φ	57φ	58φ
		59φ	60φ	61φ
		62φ	63φ	64φ
		65φ	66φ	67φ
		68φ	69φ	70φ
		71φ	72φ	73φ
		74φ	75φ	76φ
		77φ	78φ	79φ
		80φ	81φ	82φ
		83φ	84φ	85φ
		86φ	87φ	88φ
		89φ	90φ	91φ
		92φ	93φ	94φ
		95φ	96φ	97φ
		98φ	99φ	100φ

Lane width	3.50
Heavy vehicle ratio (%)	11.6



Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry		Level crossing open ratio (%) = 100%	
Lane	Left Turn	Right Turn	Through	Left Turn	Right Turn	Through	Left Turn	Right Turn	Left Turn	Right Turn
Number of lane	1.00	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00
Basic value of saturation flow rate : S_0	1,900	1,900	2,000	1,900	1,900	2,000	1,900	1,900	1,900	1,900
Adjustment factor for lane width : 0.9	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for lane width : 0.9	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : 0.9	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : 0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for heavy vehicles : 0.9	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adjustment factor for heavy vehicles : 0.9	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60
Adjustment factor for left turn : 0.8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for left turn : 0.8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(ratio of left turn vehicles)										
(decrease ratio of pedestrians)										
(effective green time)										
(green time for pedestrians)										
(through vehicle equivalent (or left turn vehicles))										
Adjustment factor for right turn : 0.9	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for right turn : 0.9	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
(probability of right turn)										
(vehicle making turns at transfer phase)										
(volume of opposite through traffic)										
(saturation flow rate of opposite approach)										
(through vehicle equivalent (or right turn vehicles))										
Saturation flow rate : S_0	3,680	1,748	0	0	0	3,496	3,680	0	1,766	1,748
Traffic volume : (heavy vehicle ratio)	1,537	1,537	0	0	0	1,537	1,537	0	1,537	1,537
Through traffic volume : (heavy vehicle ratio)	2,116	2,116	0	0	0	2,116	2,116	0	2,116	2,116
Left turn traffic volume : (heavy vehicle ratio)	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60
Total traffic volume : q	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60
Traffic volume : q	0	2,116	0	0	0	2,116	0	0	2,116	0
Flow ratio : P	0.575	0.879	0	0	0	0.773	0	0	0.617	0.415
Necessary phase ratio	1φ	1φ	1φ	1φ	1φ	1φ	1φ	1φ	1φ	1φ
	2φ	2φ	2φ	2φ	2φ	2φ	2φ	2φ	2φ	2φ
	3φ	3φ	3φ	3φ	3φ	3φ	3φ	3φ	3φ	3φ
	4φ	4φ	4φ	4φ	4φ	4φ	4φ	4φ	4φ	4φ
	5φ	5φ	5φ	5φ	5φ	5φ	5φ	5φ	5φ	5φ
	6φ	6φ	6φ	6φ	6φ	6φ	6φ	6φ	6φ	6φ
[Equations]										

During the peak hours, a large traffic congestion occurs in the SB right turn lane at peak hours. Queues = 37 veh/cycle

During the peak hours, a large traffic congestion occurs in the NB left turn lane at peak hours. Queues = 98 pcu/cycle

During the peak hours, a large traffic congestion occurs in the NB left turn lane at peak hours. Queues = 33 veh/cycle

not Good

1.2 Tinkune Signalized Intersection (2030: Without case) Current Lane Arrangement

Calculation result of Intersections (Tinkune Intersection) Current Lane Arrangement

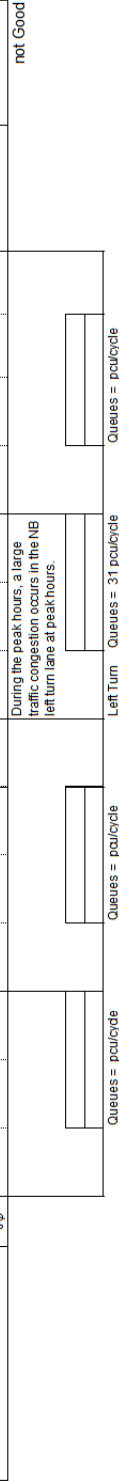
Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Name of Intersection	Tinkune Without case					
Target year	2030 peak hour					
	1φ	2φ	3φ	4φ	5φ	6φ
c (Cycle time)	31	4	51	30	4	
Lane width	3.50					
Heavy vehicle ratio (%)	12.3					



Level crossing open ratio (%) = 100%

Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry	
	Left Turn	Right Turn	Through	Right Turn	Left Turn	Through	Right Turn	Left-Through
Number of lane	2	1	2	2	1	2	2	2
Basic value disaturation flow rate : S_0	1,900	1,900	2,000	2,000	1,900	2,000	1,900	1,900
Adjustment factor for lane width : d_w	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for lane width : m	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : d_g	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : d_g	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for heavy vehicles : d_r	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adjustment factor for heavy vehicles : d_r	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30
Adjustment factor for bus-stop : d_{bs}	-	-	-	-	-	-	-	-
Adjustment factor for left turn : d_{LT}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for left turn : d_{LT}	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Adjustment factor for left turn : $L\%$	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Adjustment factor for left turn : f_p	31	31	31	31	31	31	31	31
Adjustment factor for left turn : $G\ sec$	26	26	26	26	26	26	26	26
Adjustment factor for left turn : $G_p\ sec$	-	-	-	-	-	-	-	-
Adjustment factor for left turn : E_{LT}	-	-	-	-	-	-	-	-
Adjustment factor for left turn : S_L	429	429	429	429	429	429	429	429
Adjustment factor for right turn : d_{RT}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for right turn : $R\%$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for right turn : f	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for right turn : K	3	3	3	3	3	3	3	3
Adjustment factor for right turn : q	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000
Adjustment factor for right turn : S_R	565	565	565	565	565	565	565	565
Saturation flow rate : S_A	0	3,680	1,748	0	0	0	1,748	3,680
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	310	12.30	12.30	12.30	12.30	12.30	12.30	12.30
Traffic volume : Through traffic volume (heavy vehicle ratio)	2,532	12.30	12.30	12.30	12.30	12.30	12.30	12.30
Traffic volume : Left turn traffic volume (heavy vehicle ratio)	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30
Traffic volume : Total traffic volume (heavy vehicle ratio)	2,532	12.30	12.30	12.30	12.30	12.30	12.30	12.30
Traffic volume : q	0	2,532	310	0	0	0	1,623	3,038
Flow ratio : p	0.688	0.177	0.0928	0.826	0.150	0.321	0.321	0.321
Necessary phase ratio : 1φ	0.688	0.177	0.0928	0.826	0.150	0.321	0.321	0.321
Necessary phase ratio : 2φ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Necessary phase ratio : 3φ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Necessary phase ratio : 4φ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Necessary phase ratio : 5φ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Necessary phase ratio : 6φ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Queues = pc/cycle

Queues = 31 pc/cycle

Queues = pc/cycle

Queues = pc/cycle

Queues = pc/cycle

Queues = pc/cycle

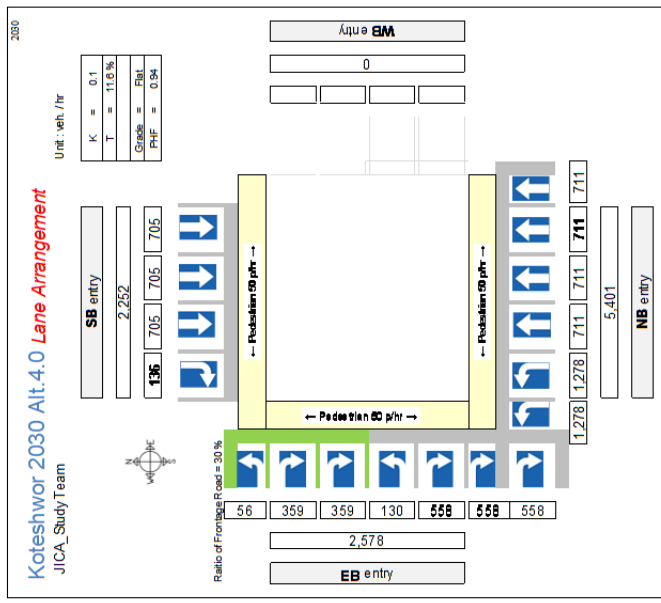
1.3 Koteswori Signalized Intersection (2030: Option 4) Additional Lane Arrangement

Calculation result of Intersections (Koteswori Intersection)

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Name of Intersection	Koteswori OPTION 4.0
Target year	2030 peak/hour
C (cycle time)	120
Lane width	3.50
Heavy vehicle ratio (%)	11.6

1φ	2φ	3φ	4φ	5φ	6φ
30	10	4	52	20	4
Y&AR		Y&AR		Y&AR	



Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry		Level crossing open ratio (%) = 100%
	Left Turn	Through	Through	Right Turn	Left Turn	Through	Right Turn	Left Turn	
Number of lane	3	1	2	4	2	4	3	1	2
Basic value disablation flow rate : S_0	1,900	1,900	2,000	2,000	1,900	2,000	1,900	1,900	1,900
Adjustment factor for lane width : 0_w	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for lane width : m	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : 0_g	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : 0_g	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for heavy vehicles : 0_r	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adjustment factor for heavy vehicles : 0_r	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60
Adjustment factor for bus-stop : 0_{bs}	-	-	-	-	-	-	-	-	-
Adjustment factor for left turn : 0_{LT}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for left turn : $L\%$	-	-	100.0	-	100.0	-	100.0	-	100.0
Adjustment factor for left turn : f_p	-	-	0.75	-	0.75	-	0.75	-	0.75
Adjustment factor for left turn : $G\ sec$	-	-	52	-	52	-	52	-	52
Adjustment factor for left turn : $G\ sec$	-	-	47	-	47	-	47	-	47
Adjustment factor for left turn : E_{LT}	-	-	4φ	-	4φ	-	4φ	-	4φ
Adjustment factor for right turn : S_0	-	-	1,423	-	1,423	-	1,423	-	1,423
Adjustment factor for right turn : 0_{RT}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for right turn : $R\%$	-	-	100.00	-	100.00	-	100.00	-	100.00
Adjustment factor for right turn : f	-	-	0.00	-	0.00	-	0.00	-	0.00
Adjustment factor for right turn : K	-	-	3	-	3	-	3	-	3
Adjustment factor for right turn : q	-	-	> 1,000	-	> 1,000	-	> 1,000	-	> 1,000
Adjustment factor for right turn : S_0	-	-	407	-	407	-	407	-	407
Saturation flow rate : S_0	0	5,520	1,748	0	3,496	7,360	0	1,766	5,244
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	136	11.60	11.60	11.60	11.60	11.60	11.60	1,676	1,748
Traffic volume : Through traffic volume (heavy vehicle ratio)	2,115	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60
Traffic volume : Left turn traffic volume (heavy vehicle ratio)	11.60	11.60	11.60	11.60	11.60	11.60	11.60	130	56
Traffic volume : Total traffic volume : q	0	2,115	136	0	2,556	2,844	0	130	1,676
Traffic volume : q	0	2,115	136	0	2,556	2,844	0	130	1,676
Flow ratio	0	0.383	0.078	0	0.731	0.386	0	0.074	0.320
Necessary phase ratio	1φ	0.383	0.078	0	0.731	0.386	0	0.074	0.320
	2φ	0.383	0.078	0	0.731	0.386	0	0.074	0.320
	3φ	0.383	0.078	0	0.731	0.386	0	0.074	0.320
	4φ	0.383	0.078	0	0.731	0.386	0	0.074	0.320
	5φ	0.383	0.078	0	0.731	0.386	0	0.074	0.320
	6φ	0.383	0.078	0	0.731	0.386	0	0.074	0.320
Saturation degree of phase	0.320	0.205	0.000	0.386	0.000	0.386	0.000	0.320	0.205
Saturation degree of intersection	0.911	0.911	0.911	0.911	0.911	0.911	0.911	0.911	0.911
Overall Status	almost Good								

1.4 Tinkune Signalized Intersection (2030: Option 4) Additional Lane Arrangement

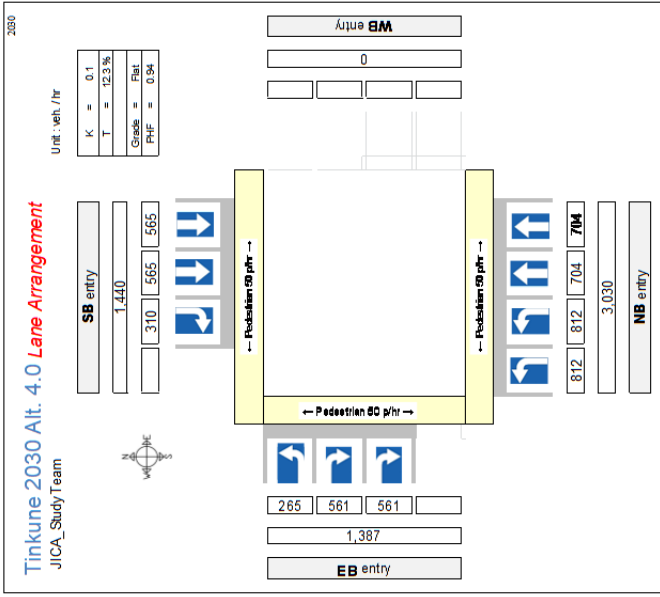
Calculation result of Intersections (Tinkune Intersection)

Name of Intersection	Tinkune OPTION 4.0	1 ϕ	2 ϕ	3 ϕ	4 ϕ	5 ϕ	6 ϕ
Target year	2030 peak hour	45	4	52	15	4	
		Y&AR		Y&AR		Y&AR	
		120					
		Lane width : 3.50					
		Heavy vehicle ratio (%) : 12.3					

xxx

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Lane Configuration and Turning movement



Approaches	A. SB entry				B. WB entry				C. NB entry				D. EB entry				Level crossing open ratio (%) = 100%
	Left Turn	Through	Right Turn	Through	Left Turn	Through	Right Turn	Through	Left Turn	Through	Right Turn	Through	Left Turn	Through	Right Turn	Through	
Number of lane	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2	2	
Basic value saturation flow rate : S_0	1,900	2,000	1,900	2,000	2,000	2,000	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	
Adjustment factor for lane width : ϕ_w	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adjustment factor for approach grade : ϕ_g	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
Adjustment factor for approach grade : ϕ_g	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adjustment factor for heavy vehicles : ϕ_H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Adjustment factor for heavy vehicles : ϕ_H	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adjustment factor for heavy vehicles : ϕ_H	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	
Adjustment factor for bus-stop : ϕ_{bs}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Adjustment factor for left turn (ratio of left turn vehicles) : $\phi_{L\%}$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adjustment factor for left turn (decrease ratio of pedestrians) : ϕ_f	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Adjustment factor for left turn (effective green time) : $\phi_{G sec}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Adjustment factor for left turn (green time for pedestrians) : $\phi_{G, sec}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Adjustment factor for left turn (through vehicle equivalent for left turn vehicles) : $\phi_{E/T}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Adjustment factor for left turn (through vehicle equivalent for right turn vehicles) : $\phi_{E/T}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Adjustment factor for right turn (ratio of right turn vehicles) : ϕ_R	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adjustment factor for right turn (probability of right turn) : ϕ	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	
Adjustment factor for right turn (vehicle making turns at transfer phases) : K	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Adjustment factor for right turn (volume of opposite through traffic) : q	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	
Adjustment factor for right turn (saturation flow rate of opposite approach) : S_0	328	328	328	328	328	328	328	328	328	328	328	328	328	328	328	328	
Adjustment factor for right turn (through vehicle equivalent for right turn vehicles) : $\phi_{E/T}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Saturation flow rate : S_0	0	3,680	1,748	0	0	0	0	0	0	0	0	0	0	0	0	0	
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	
Traffic volume : Through traffic volume (heavy vehicle ratio)	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	
Traffic volume : Left turn traffic volume (heavy vehicle ratio)	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	
Traffic volume : Total traffic volume : q	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	1,130	
Traffic volume : Heavy vehicle ratio	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	
Flow ratio	0	1,130	310	0	0	0	0	0	0	0	0	0	0	0	0	0	
Necessary phase ratio	0.307	0.307	0.177														
	1 ϕ	1 ϕ	0.177														
	2 ϕ	2 ϕ	0.307														
	3 ϕ	3 ϕ	0.307														
	4 ϕ	4 ϕ	310-328 OK	1624-1851 OK	0.303	0.303	0.303	0.303	0.303	0.303	0.303	0.303	0.303	0.303	0.303	0.303	
	5 ϕ	5 ϕ	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	
	6 ϕ	6 ϕ															

Queues = pcu/cycle

Queues = pcu/cycle

Queues = pcu/cycle

Queues = pcu/cycle

Queues = pcu/cycle

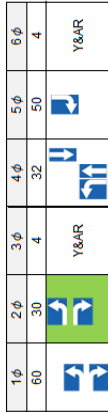
Excellent

1.5 Koteshwor Signalized Intersection (2030: Option 5) Additional Lane Arrangement

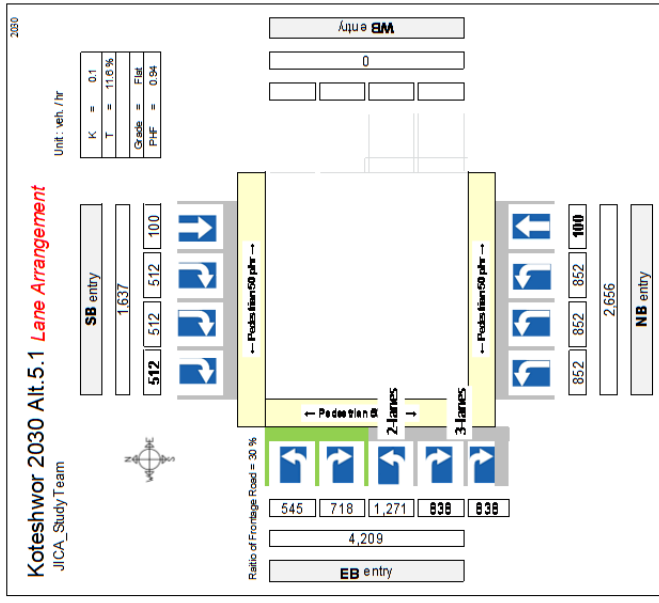
Calculation result of Intersections (Koteshwor Intersection)

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Lane width	3.50	Heavy vehicle ratio (%)	11.6
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Name of Intersection	Koteshwor OPTION 5		
Target year	2030 peak/hour	c (Cycle time)	180



Approaches	A. SB entry			B. WB entry			C. NB entry			D. EB entry			Level crossing open ratio (%) = 100%
	Left Turn	Through	Right Turn	Through	Right Turn	Through	Left Turn	Through	Right Turn	Left Turn	Through	Right Turn	
Number of lane	1	2,000	1,900	3	2,000	1,900	3	2,000	1	1,900	1,900	1,900	1
Basic value disaturation flow rate : S_0	1,900	2,000	1,900	2,000	2,000	1,900	2,000	2,000	1,900	1,900	1,900	1,900	1,900
Adjustment factor for lane width : W_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for lane width : W_2	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : G_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : G_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for heavy vehicles : H_1	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adjustment factor for heavy vehicles : H_2	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60
Adjustment factor for bus-stop : B_1	-	-	-	-	-	-	-	-	-	-	-	-	-
Adjustment factor for left turn (ratio of left turn vehicles) : L_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for left turn (decrease ratio of pedestrians) : L_2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Adjustment factor for left turn (effective green time) : L_3	32	32	32	32	32	32	32	32	32	32	32	32	32
Adjustment factor for left turn (green time for pedestrians) : L_4	27	27	27	27	27	27	27	27	27	27	27	27	27
Adjustment factor for left turn (through vehicle equivalent for left turn vehicles) : L_5	885	885	885	885	885	885	885	885	885	885	885	885	885
Adjustment factor for right turn (ratio of right turn vehicles) : R_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for right turn (probability of right turn) : R_2	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Adjustment factor for right turn (vehicle making turns at transfer phases) : R_3	3	3	3	3	3	3	3	3	3	3	3	3	3
Adjustment factor for right turn (volume of opposite through traffic) : R_4	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000
Adjustment factor for right turn (saturation flow rate of opposite approach) : R_5	1,643	1,643	1,643	1,643	1,643	1,643	1,643	1,643	1,643	1,643	1,643	1,643	1,643
Adjustment factor for right turn (through vehicle equivalent for right turn vehicles) : R_6	1,840	1,840	1,840	1,840	1,840	1,840	1,840	1,840	1,840	1,840	1,840	1,840	1,840
Saturation flow rate : S_A	0	1,840	5,244	0	0	0	0	5,244	1,840	0	3,531	5,244	1,748
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	1,536	1,536	1,536	1,536	1,536	1,536	1,536	1,536	1,536	1,536	1,536	1,536	1,536
Traffic volume : Through traffic volume (heavy vehicle ratio)	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60
Traffic volume : Left turn traffic volume (heavy vehicle ratio)	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60
Traffic volume : Total traffic volume : q	0	100	1,536	0	0	0	0	2,556	100	0	1,271	1,676	545
Traffic volume : q	0	100	1,536	0	0	0	0	2,556	100	0	1,271	1,676	545
Flow ratio	0.054	0.054	0.293	0.054	0.054	0.054	0.054	0.487	0.054	0.054	0.360	0.320	0.411
Necessary phase ratio	1 ϕ	2 ϕ	3 ϕ	4 ϕ + 5 ϕ	5 ϕ	6 ϕ	1271 > 1267 OK	1271 > 1267 OK	0.320	0.411	0.320	0.411	0.411
	0.054	0.054	0.293	2556-2555 See below \downarrow	0.054	0.054	545-317 See below \downarrow	0.054	0.054	0.054	0.054	0.054	0.054
	1,536 > 1,643 OK	1,536 > 1,643 OK	1,536 > 1,643 OK	4 ϕ + 5 ϕ	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255
				During the peak hours, a slight congestion occurs in the NB left turn lanes.				During the peak hours, a slight congestion occurs in the EB (Fronage road) left turn lane.					
	Queues = pair/cycle	Queues = pair/cycle	Queues = pair/cycle	Queues = 15 pc/cycle	Queues = 15 pc/cycle	Queues = 15 pc/cycle	Queues = 15 pc/cycle	Queues = 15 pc/cycle	Queues = 15 pc/cycle	Queues = 15 pc/cycle	Queues = 15 pc/cycle	Queues = 15 pc/cycle	Queues = 15 pc/cycle
				Left Turn	Left Turn	Left Turn	Left Turn	Left Turn	Left Turn	Left Turn	Left Turn	Left Turn	Left Turn
				Queues = 11 veh/cycle	Queues = 11 veh/cycle	Queues = 11 veh/cycle	Queues = 11 veh/cycle	Queues = 11 veh/cycle	Queues = 11 veh/cycle	Queues = 11 veh/cycle	Queues = 11 veh/cycle	Queues = 11 veh/cycle	Queues = 11 veh/cycle
				0.411	0.411	0.411	0.411	0.411	0.411	0.411	0.411	0.411	0.411
				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
				0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
				0.785	0.785	0.785	0.785	0.785	0.785	0.785	0.785	0.785	0.785
				Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent

1.6 Tinkune Signalized Intersection (2030: Option 5) Additional Lane Arrangement

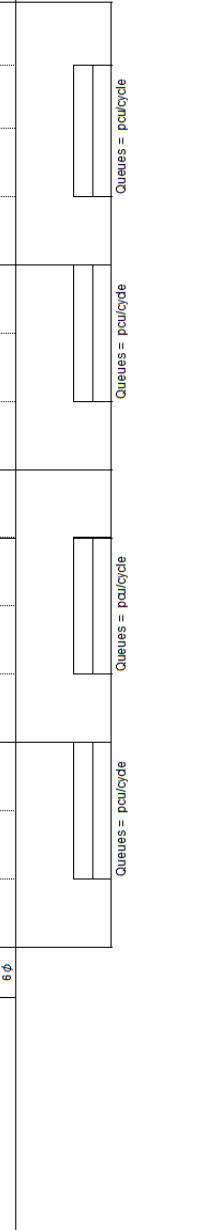
Calculation result of Intersections (Tinkune Intersection)

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Lane Configuration and Turning movement

Name of Intersection	Tinkune OPTION 5					
Target year	2030 peakhour					
	1ϕ	2ϕ	3ϕ	4ϕ	5ϕ	6ϕ
c (Cycle time)	45	4	52	15	4	Y&AR
Lane width	3.50					
Heavy vehicle ratio (%)	12.3					

Approaches	A. SB entry			B. WB entry			C. NB entry			D. EB entry			Level crossing open ratio (%) = 100%
	Left Turn	Through	Right Turn	Through	Left Turn	Through	Right Turn	Through	Left Turn	Through	Right Turn		
Number of lane	1.00	2.00	1.90	2.00	1.90	2.00	1.90	2.00	1.90	1.00	1.00	1.90	1.00
Basic value disablation flow rate : S_0	1.00	2.00	1.90	2.00	1.90	2.00	1.90	2.00	1.90	1.00	1.00	1.90	1.00
Adjustment factor for lane width (lane width) : ϕ_w	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : ϕ_g	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : ϕ_g	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for heavy vehicles (ratio of heavy vehicles) : ϕ_r	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adjustment factor for heavy vehicles : ϕ_r	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30
Adjustment factor for bus-stop : ϕ_{bs}	-	-	-	-	-	-	-	-	-	-	-	-	-
Adjustment factor for left turn (ratio of left turn vehicles) : ϕ_{lt}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(decrease ratio of pedestrians) : f_p	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
(effective green time) : G_{sec}	45	45	45	45	45	45	45	45	45	45	45	45	45
(green time for pedestrians) : G_{ped}	40	40	40	40	40	40	40	40	40	40	40	40	40
(though vehicle equivalent for left turn vehicles) : E_{LT}	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ
(though vehicle equivalent for right turn vehicles) : E_{RT}	214	214	214	214	214	214	214	214	214	214	214	214	214
Adjustment factor for right turn (ratio of right turn vehicles) : $R\%$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(probability of right turn) : f	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(vehicle making turns at transfer phases) : K	3	3	3	3	3	3	3	3	3	3	3	3	3
(volume of opposite through traffic) : q	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000
(saturation flow rate of opposite approach) : S_0	328	328	328	328	328	328	328	328	328	328	328	328	328
Traffic flow rate : S_x	0	3,680	1,748	0	0	0	1,748	3,680	0	1,748	1,748	0	0
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	310	310	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30
Through traffic volume (heavy vehicle ratio)	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402
Left turn traffic volume (heavy vehicle ratio)	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30	12.30
Total traffic volume : q	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402
Traffic volume : q	0	1,402	310	0	0	0	0	0	0	0	0	0	0
Flow ratio	0.381	0.381	0.177	0.381	0.177	0.381	0.177	0.381	0.177	0.381	0.177	0.381	0.177
Necessary phase ratio	1ϕ	1ϕ	1ϕ	1ϕ	1ϕ	1ϕ	1ϕ	1ϕ	1ϕ	1ϕ	1ϕ	1ϕ	1ϕ
	2ϕ	2ϕ	2ϕ	2ϕ	2ϕ	2ϕ	2ϕ	2ϕ	2ϕ	2ϕ	2ϕ	2ϕ	2ϕ
	3ϕ	3ϕ	3ϕ	3ϕ	3ϕ	3ϕ	3ϕ	3ϕ	3ϕ	3ϕ	3ϕ	3ϕ	3ϕ
	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ	4ϕ
	5ϕ	5ϕ	5ϕ	5ϕ	5ϕ	5ϕ	5ϕ	5ϕ	5ϕ	5ϕ	5ϕ	5ϕ	5ϕ
	6ϕ	6ϕ	6ϕ	6ϕ	6ϕ	6ϕ	6ϕ	6ϕ	6ϕ	6ϕ	6ϕ	6ϕ	6ϕ



1.7 Koteshwor Signalized Intersection (2020: Without case) Current Lane Arrangement

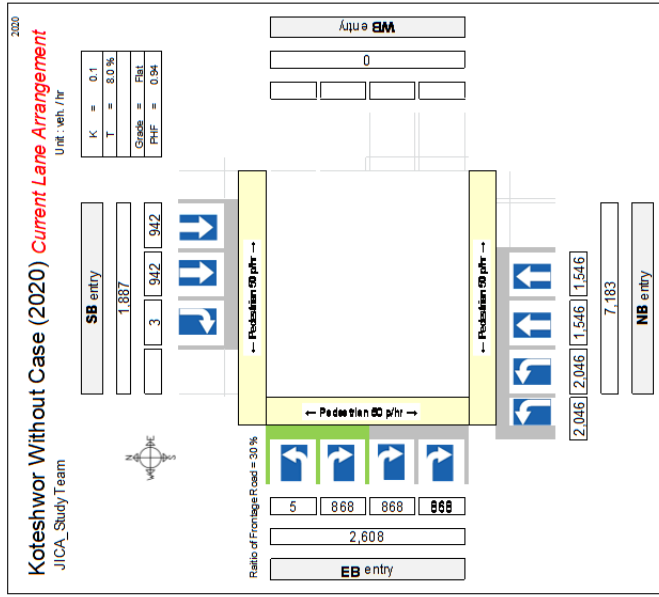
Calculation result of intersections (Koteshwor Intersection)

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Lane width	3.50	Heavy vehicle ratio (%)	8.0
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Name of Intersection	Koteshwor Current Lane Arrangement (C: Cycle time)		
Target year	2020	peak/hour	120



Approaches	A. SB entry			B. WB entry			C. NB entry			D. EB entry			Level crossing open ratio (%) = 100%
	Left Turn	Through	Right Turn	Through	Right Turn	Through	Left Turn	Through	Right Turn	Left Turn	Through	Right Turn	
Number of lane	1	2	1	2	2	2	2	2	2	2	2	1	1
Basic value disablation flow rate : S_0	1,900	2,000	1,900	2,000	2,000	1,900	1,900	2,000	2,000	1,900	1,900	1,900	1,900
Adjustment factor for lane width : 0_w	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for lane width (lane width) : m	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : 0_g	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade (approach grade) : 0_g	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for heavy vehicles : 0_r	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adjustment factor for heavy vehicles (ratio of heavy vehicles) : 0_r	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for bus-stop : 0_{bs}	-	-	-	-	-	-	-	-	-	-	-	-	-
Adjustment factor for left turn (ratio of left turn vehicles) : 0_{LT}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for left turn (decrease ratio of pedestrians) : L	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Adjustment factor for left turn (effective green time) : G	40	40	40	40	40	40	40	40	40	40	40	40	40
Adjustment factor for left turn (green time for pedestrians) : G_p	35	35	35	35	35	35	35	35	35	35	35	35	35
Adjustment factor for left turn (through vehicle equivalent for left turn vehicles) : E_{LT}	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100
Adjustment factor for right turn (ratio of right turn vehicles) : R	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for right turn (probability of right turn) : f	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for right turn (vehicle making turns at transfer phases) : K	3	3	3	3	3	3	3	3	3	3	3	3	3
Adjustment factor for right turn (volume of opposite through traffic) : q	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000	> 1,000
Adjustment factor for right turn (saturation flow rate of opposite approach) : S_0	169	169	169	169	169	169	169	169	169	169	169	169	169
Adjustment factor for right turn (through vehicle equivalent for right turn vehicles) : E_{RT}	-	-	-	-	-	-	-	-	-	-	-	-	-
Saturation flow rate : S_0	0	3,800	1,805	0	0	0	3,610	3,800	0	0	3,610	1,805	1,805
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	0	1,884	800	1,884	800	800	800	800	800	800	800	800	800
Traffic volume : Through traffic volume (heavy vehicle ratio)	0	800	800	800	800	800	800	800	800	800	800	800	800
Traffic volume : Left turn traffic volume (heavy vehicle ratio)	0	800	800	800	800	800	800	800	800	800	800	800	800
Traffic volume : Total traffic volume : q	0	1,884	3	0	0	0	4,092	3,092	0	0	1,736	5	868
Traffic volume : q	0	1,884	3	0	0	0	4,092	3,092	0	0	1,736	5	868
Flow ratio	0.466	0.002	0.002	1.134	0.814	0.814	0.481	0.003	0.481	0.481	0.003	0.481	0.481
Necessary phase ratio	1.00	0.481	0.481	1.00	0.481	0.481	1.00	0.481	0.481	0.481	1.00	0.481	0.481
	2.045	2.045	1.546	1.546	1.546	1.546	2.045	2.045	1.546	1.546	2.045	2.045	1.546
	7.183	7.183	7.183	7.183	7.183	7.183	7.183	7.183	7.183	7.183	7.183	7.183	7.183
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.814	0.814	0.814	0.814	0.814	0.814	0.814	0.814	0.814	0.814	0.814	0.814	0.814
	1.775	1.775	1.775	1.775	1.775	1.775	1.775	1.775	1.775	1.775	1.775	1.775	1.775
	not Good	not Good	not Good	not Good	not Good	not Good	not Good	not Good	not Good	not Good	not Good	not Good	not Good

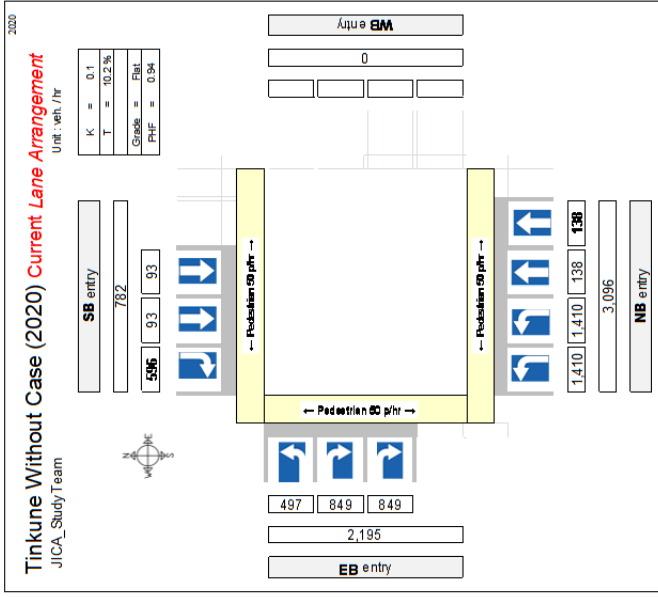
1.8 Tinkune Signalized Intersection (2020: Without case) Current Lane Arrangement

Calculation result of Intersections (Tinkune Intersection)

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Lane width	3.50	Heavy vehicle ratio (%)	10.2
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Name of Intersection	Tinkune					
	2020 peak/hour					
Target year	100					
Approaches	1φ	2φ	3φ	4φ	5φ	6φ
	32	4	30	30	4	
Lane	Y&AR		Y&AR		Y&AR	
	[Diagram]		[Diagram]		[Diagram]	



Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry	
Lane	Left Turn	Through	Through	Right Turn	Left Turn	Through	Right Turn	Left Turn
Number of lane	1	2	2	2	2	2	2	2
Basic value saturation flow rate : S_0	1,900	2,000	2,000	1,900	1,900	2,000	1,900	1,900
Adjustment factor for lane width : W_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : G_1	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for heavy vehicles : H_1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for bus-stop : B_1	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adjustment factor for left turn : L_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for right turn : R_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Effective green time : G_{eff}	10.20	10.20	10.20	10.20	10.20	10.20	10.20	10.20
Through traffic volume	0	3,720	0	0	3,534	3,720	0	1,785
Left turn traffic volume	0	0	0	0	0	0	0	0
Right turn traffic volume	0	0	0	0	0	0	0	0
Total traffic volume	0	3,720	0	0	3,534	3,720	0	1,785
Heavy vehicle ratio	0	0	0	0	0	0	0	0
Saturation flow rate	0	1,767	0	0	1,785	1,698	0	1,698
Traffic volume	0	596	0	0	596	596	0	596
Flow ratio	0	0.050	0	0	0.242	0.074	0	0.278
Necessary phase ratio	1φ	0.050	0.074	0.074	0.242	0.074	0.480	0.480
2φ	0.050	0.050	0.074	0.074	0.242	0.074	0.480	0.480
3φ	0.050	0.050	0.074	0.074	0.242	0.074	0.480	0.480
4φ	0.050	0.050	0.074	0.074	0.242	0.074	0.480	0.480
5φ	0.050	0.050	0.074	0.074	0.242	0.074	0.480	0.480
6φ	0.050	0.050	0.074	0.074	0.242	0.074	0.480	0.480
Saturation degree of phase	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Saturation degree of intersection	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Level crossing open ratio (%) = 100%	100%	100%	100%	100%	100%	100%	100%	100%

Excellent

Queues = pcu/cycle

Queues = pcu/cycle

Queues = pcu/cycle

Queues = pcu/cycle

2.1 Jadibuti Signalized Intersection (2030: With case) Current Lane Arrangement

Calculation result of Intersections (Jadibuti Intersection)

x/xx

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Name of Intersection		Jadibuti Current Lane		c (Cycle time)		1 φ		2 φ		3 φ		4 φ		5 φ		6 φ		Lane width		Heavy vehicle ratio (%)	
Target year		2030 peakhour		70		32		10		4		20		4		Y&AR		3.50		10.7	
Approaches																					
Lane		Left/Right		Right Turn		Through		Right Turn		Through		Right Turn		Through		Through		Left/Through		Through	
Number of lane		1		1		3		1		1		1		1		2		1		2	
Basic value (saturation flow rate)		S ₀		1,900		2,000		1,900		1,900		1,900		1,900		2,000		2,000		2,000	
Adjustment factor for lane width (lane width)		w _v		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Adjustment factor for approach grade (approach grade)		g _a		3.50		3.50		3.50		3.50		3.50		3.50		3.50		3.50		3.50	
Adjustment factor for heavy vehicles (ratio of heavy vehicles)		h _v		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Adjustment factor for bus-stop (ratio of left turn vehicles)		b _{st}		0.93		0.93		0.93		0.93		0.93		0.93		0.93		0.93		0.93	
Adjustment factor for left turn (ratio of left turn vehicles)		L _v		10.70		10.70		10.70		10.70		10.70		10.70		10.70		10.70		10.70	
Adjustment factor for right turn (probability of right turn)		R _v		0.87		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Adjustment factor for left turn (decrease ratio of pedestrians)		L _p		40.1		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Adjustment factor for left turn (effective green time)		G _{sec}		0.95		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Adjustment factor for left turn (green time for pedestrians)		G _{p, sec}		20		27		27		27		27		27		27		27		27	
Adjustment factor for left turn (through vehicle equivalent for left turn vehicles)		E _{LT}		1.38		1.38		1.38		1.38		1.38		1.38		1.38		1.38		1.38	
Adjustment factor for right turn (ratio of right turn vehicles)		R _v		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Adjustment factor for right turn (probability of right turn)		R _p		100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0	
Adjustment factor for left turn (vehicle making turns at transfer phases)		K		3		3		3		3		3		3		3		3		3	
Adjustment factor for left turn (volume of opposite through traffic)		q		> 1,000		> 1,000		> 1,000		> 1,000		> 1,000		> 1,000		> 1,000		> 1,000		> 1,000	
Adjustment factor for left turn (saturation flow rate of opposite approach)		S ₀		426		426		426		426		426		426		426		426		426	
Adjustment factor for left turn (through vehicle equivalent for right turn vehicles)		E _{RT}		1.534		1.767		1.767		1.767		1.767		1.767		1.767		1.767		1.767	
Saturation flow rate		S _a		1,534		1,767		1,767		1,767		1,767		1,767		1,767		1,767		1,767	
Traffic volume		Right turn traffic volume (heavy vehicle ratio)		437		437		219		219		219		219		219		219		219	
Through traffic volume (heavy vehicle ratio)		261		261		4,701		4,701		4,701		4,701		4,701		4,701		4,701		4,701	
Left turn traffic volume (heavy vehicle ratio)		175		175		10.70		10.70		10.70		10.70		10.70		10.70		10.70		10.70	
Total traffic volume (heavy vehicle ratio)		436		436		4,701		4,701		4,701		4,701		4,701		4,701		4,701		4,701	
Flow ratio		p		0.284		0.842		0.842		0.842		0.842		0.842		0.842		0.842		0.842	
Necessary phase ratio		1 φ		0.247		0.842		0.842		0.842		0.842		0.842		0.842		0.842		0.842	
		2 φ		0.247		0.842		0.842		0.842		0.842		0.842		0.842		0.842		0.842	
		3 φ		0.247		0.842		0.842		0.842		0.842		0.842		0.842		0.842		0.842	
		4 φ		0.247		0.842		0.842		0.842		0.842		0.842		0.842		0.842		0.842	
		5 φ		0.247		0.842		0.842		0.842		0.842		0.842		0.842		0.842		0.842	
		6 φ		0.247		0.842		0.842		0.842		0.842		0.842		0.842		0.842		0.842	
		Level crossing open ratio (%)		100%		100%		100%		100%		100%		100%		100%		100%		100%	
		EB entry		4,314		4,314		4,314		4,314		4,314		4,314		4,314		4,314		4,314	
		SB entry		873		873		873		873		873		873		873		873		873	
		WB entry		1,567		1,567		1,567		1,567		1,567		1,567		1,567		1,567		1,567	
		NB entry		0		0		0		0		0		0		0		0		0	
		Saturation degree of phase		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
		Saturation degree of intersection		0.284		0.842		0.842		0.842		0.842		0.842		0.842		0.842		0.842	
		1:127		1:127		1:127		1:127		1:127		1:127		1:127		1:127		1:127		1:127	
		No good		No good		No good		No good		No good		No good		No good		No good		No good		No good	

Lack of The number of through lanes in WB and EB.

2.2 Jadibuti Signalized Intersection (2030: With case) Additional Lane Arrangement

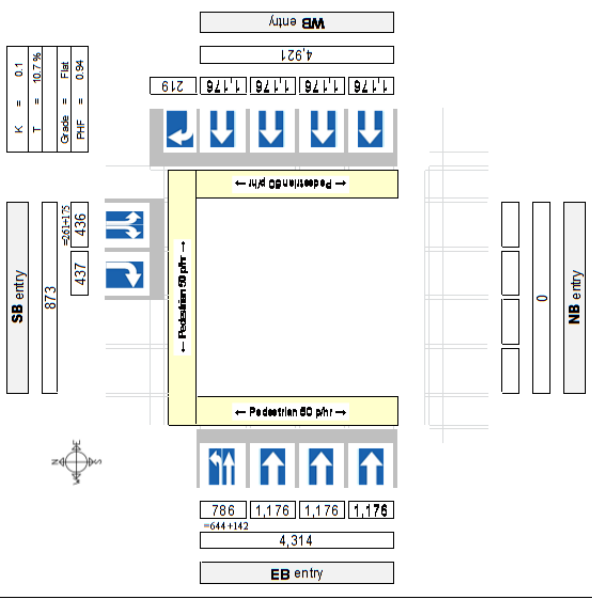
Calculation result of Intersections (Jadibuti Intersection)

Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry	
	Left	Right	Through	Right Turn	Through	Right Turn	Left	Through
Number of lane	1	1	4	1	1	1	1	3
Basic value (saturation flow rate) : S_0	1,900	1,900	2,000	1,900	2,000	2,000	2,000	2,000
Adjustment factor for lane width : W_0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for lane width : W_1	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : G_0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : G_1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for heavy vehicles : H_0	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adjustment factor for heavy vehicles : H_1	10.70	10.70	10.70	10.70	10.70	10.70	10.70	10.70
Adjustment factor for bus-stop : B_0	-	-	-	-	-	-	-	-
Adjustment factor for left turn (ratio of left turn vehicles) : L_0	0.87	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for left turn (decrease ratio of pedestrians) : L_1	40.1	-	-	-	-	-	-	-
Adjustment factor for left turn (effective green time) : L_2	0.95	-	-	-	-	-	-	-
Adjustment factor for left turn (green time for pedestrians) : L_3	20	-	-	-	-	-	-	-
Adjustment factor for left turn (through vehicle equivalent for left turn vehicles) : L_4	27	-	-	-	-	-	-	-
Adjustment factor for left turn (through vehicle equivalent for right turn vehicles) : L_5	1.38	-	-	-	-	-	-	-
Adjustment factor for right turn (ratio of right turn vehicles) : R_0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for right turn (probability of right turn) : R_1	100.0	-	-	-	-	-	-	-
Adjustment factor for right turn (vehicle making turns at transfer phases) : R_2	3	-	-	-	-	-	-	-
Adjustment factor for right turn (volume of opposite through traffic) : R_3	> 1,000	-	-	-	-	-	-	-
Adjustment factor for right turn (saturation flow rate of opposite approach) : R_4	426	-	-	-	-	-	-	-
Adjustment factor for right turn (through vehicle equivalent for right turn vehicles) : R_5	-	-	-	-	-	-	-	-
Saturation flow rate : S_0	1,534	1,767	0	7,440	1,767	0	0	0
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	437	219	0	1,767	0	0	0	0
Traffic volume : Through traffic volume (heavy vehicle ratio)	10.70	10.70	4,704	10.70	10.70	10.70	10.70	3,528
Traffic volume : Left turn traffic volume (heavy vehicle ratio)	261	175	10.70	10.70	10.70	10.70	10.70	10.70
Traffic volume : Total traffic volume (heavy vehicle ratio)	436	437	4,704	219	0	0	0	3,528
Flow ratio : p	0.284	0.247	0.632	0.632	0	0	0	0.512
Necessary phase ratio : 1ϕ	0.284	0.247	0.632	0.632	0	0	0	0.512
Necessary phase ratio : 2ϕ	0.284	0.247	0.632	0.632	0	0	0	0.512
Necessary phase ratio : 3ϕ	0.284	0.247	0.632	0.632	0	0	0	0.512
Necessary phase ratio : 4ϕ	0.284	0.247	0.632	0.632	0	0	0	0.512
Necessary phase ratio : 5ϕ	0.284	0.247	0.632	0.632	0	0	0	0.512
Necessary phase ratio : 6ϕ	0.284	0.247	0.632	0.632	0	0	0	0.512

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Lane Configuration and Turning movement

Jadibuti (2030) Lane Arrangement



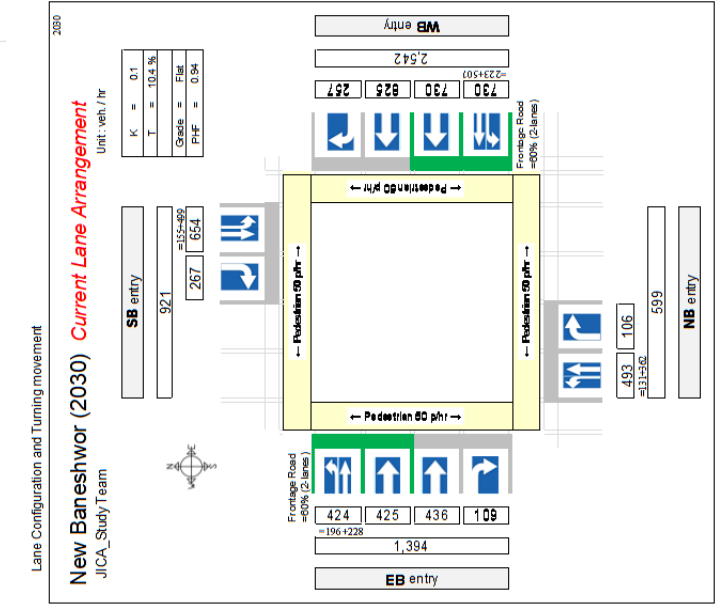
Saturation degree of phase	Saturation degree of intersection
0.632	0.917
0.000	
0.000	
0.284	
0.000	

Almost good

3.1 New Baneshwor Signalized Intersection (2030: Without case) Current Lane Arrangement

Calculation result of intersections (New Baneshwor Intersection)

Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry	
	Left	Right	Left	Through	Left	Through	Left	Through
Number of lane	1	1	1	1	1	1	1	1
Basic value (saturation flow rate) : S_0	2,000	1,900	2,000	2,000	1,900	1,900	2,000	2,000
Adjustment factor for lane width : 0_w	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : 0_g	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for heavy vehicles : 0_r	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for bus-stop : 0_{bs}	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40
Adjustment factor for left turn (ratio of left turn vehicles) : 0_{LT}	0.95	1.00	0.93	1.00	1.00	1.00	0.89	1.00
(decrease ratio of pedestrians) : f_p	23.7	30.5	26.6	26.6	0.15	0.15	46.2	0.15
(effective green time) : G_{sec}	15	37	15	15	37	37	32	32
(green time for pedestrians) : $G_{p,sec}$	10	32	10	10	10	10	32	32
(through vehicle equivalent for left turn vehicles) : E_{LT}	1.22	1.22	1.22	1.22	1.22	1.22	1.26	1.26
Adjustment factor for right turn (ratio of right turn vehicles) : $R\%$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(probability of right turn) : f	0.68	0.68	0.00	0.00	0.69	0.69	0.00	0.00
(vehicle making turns at transfer phases) : K	3	3	3	3	> 1,000	> 1,000	3	3
(volume of opposite through traffic) : S_0	362	362	290	290	490	490	290	290
(saturation flow rate of opposite approach) : S_0	53	53	290	290	53	53	290	290
(through vehicle equivalent for right turn vehicles) : E_{RT}	4.0	4.0	2.0	2.0	4.0	4.0	5.0	5.0
Saturation flow rate : S_0	1,767	1,767	0	1,860	1,756	1,767	0	1,860
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	53	214	10.40	10.40	257	53	109	10.40
Through traffic volume (heavy vehicle ratio)	499	507	730	825	362	425	436	436
Left turn traffic volume (heavy vehicle ratio)	155	223	10.40	10.40	131	196	10.40	10.40
Total traffic volume : q (heavy vehicle ratio)	654	730	825	825	257	483	53	424
Traffic volume : q (heavy vehicle ratio)	654	214	730	825	257	483	53	424
Flow ratio : p	0.370	0.424	0.392	0.444	0.281	0.256	0.228	0.234
Necessary phase ratio	1.0	0.424	0.392	0.444	0.281	0.256	0.228	0.234
	2.0	257<990 OK						109<990 OK
	3.0							
	4.0	0.370	4.0+5.0=267	0.281	4.0+5.0=106	0.256	0.228	0.234
	5.0	214<290 OK						0.370
	6.0							0.000



Saturation degree of phase	Saturation degree of intersection
0.000	0.444
0.000	0.814
0.000	0.000

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Lane Configuration and Turning movement

New Baneshwor (2030) Current Lane Arrangement
JICA_Study Team

K =	0.1
T =	10.4%
Grade =	Flat
P.H.F =	0.94

Unit: veh/hr



Frontage Road = 60% (2-lanes)
82+228 = 1,394

Frontage Road = 60% (2-lanes)
424 + 425 + 436 + 106 = 1,391

Frontage Road = 60% (2-lanes)
493 + 106 = 599

Frontage Road = 60% (2-lanes)
730 + 825 + 267 = 1,822

Frontage Road = 60% (2-lanes)
730 + 825 + 267 = 1,822

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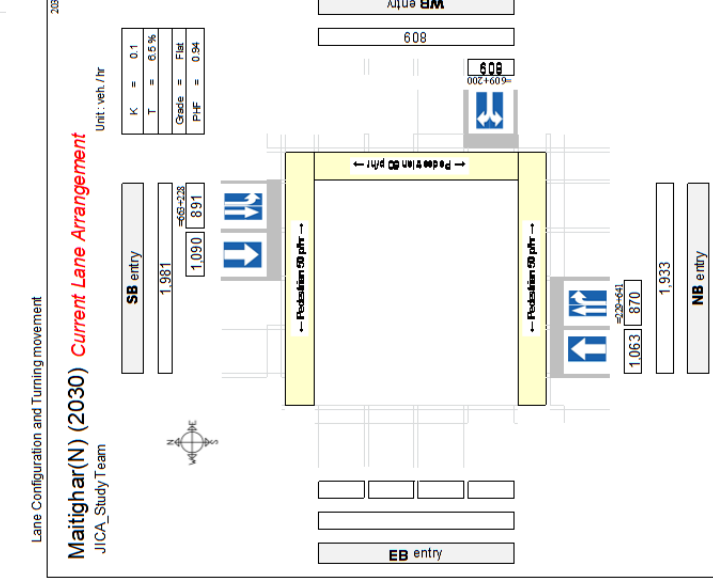
Frontage Road = 60% (2-lanes)
730 + 825 + 267 = 1,822

4.1 Maitighar (N) Signalized Intersection (2030: Without case) Current Lane Arrangement

Calculation result of intersections (Maitighar(N) Intersection)

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Name of Intersection	Maitighar(N) Current Lane	1 ϕ	2 ϕ	3 ϕ	4 ϕ	5 ϕ	6 ϕ
Target year	2030 peak hour	47	35	4	30	4	
							Y&AR
							Y&AR
							Y&AR
							Y&AR



Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry	
	Left-Through	Right Turn	Left-Right	Through	Right-Through	Through	Right Turn	Left-Through
Number of lane	1	1	1	1	1	1	1	1
Basic value disaburton flow rate : S_b	2,000	1,900	2,000	2,000	2,000	2,000	2,000	2,000
Adjustment factor for lane width : Q_w	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : Q_g	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for heavy vehicles : Q_r	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adjustment factor for bus-stop : Q_{bs}	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Adjustment factor for left turn (ratio of left turn vehicles) : Q_{LT}	0.94	1.00	0.95	1.00	1.00	1.00	1.00	1.00
(decrease ratio of pedestrians) : f_p	25.6	75.3	0.15					
(effective green time) : G_{sec}	47	30	42					
(green time for pedestrians) : $G_{p, sec}$	42	25	42					
(through vehicle equivalent for left turn vehicles) : E_{LT}	1.27	1.07	1.27					
Adjustment factor for right turn (ratio of right turn vehicles) : Q_{RT}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(probability of right turn) : f	24.7							
(vehicle making turns at transfer phases) : K	0							
(volume of opposite through traffic) : Q	0							
(saturation flow rate of opposite approach) : S_k								
(through vehicle equivalent for right turn vehicles) : E_{RT}								
Saturation flow rate : S_a	1,796	1,920	0	1,733	0	1,920	1,920	0
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	200							
Through traffic volume (heavy vehicle ratio)	663	1,090				1,063	641	
Left turn traffic volume (heavy vehicle ratio)	6.50	6.50				6.50	6.50	
Total traffic volume : q (heavy vehicle ratio)	228	6.50				6.50	6.50	
Total traffic volume : q (heavy vehicle ratio)	891	1,090	0	0	0	1,063	641	0
Traffic volume : q (heavy vehicle ratio)	891	1,090	0	0	0	1,063	641	0
Flow ratio : p	0.496	0.568				0.554	0.568	
Necessary phase ratio	1 ϕ	0.568				0.554	0.568	
	2 ϕ							
	3 ϕ							
	4 ϕ							
	5 ϕ							
	6 ϕ							
Saturation degree of phase	0.568					0.568		
Saturation degree of intersection	0.000					0.000		
	0.000					0.000		
	0.467					0.467		
	0.000					0.000		
								1.035
Result	Almost Good							
Queues = pcu/cycle	Queues = pcu/cycle		Queues = pcu/cycle		Queues = pcu/cycle		Queues = pcu/cycle	

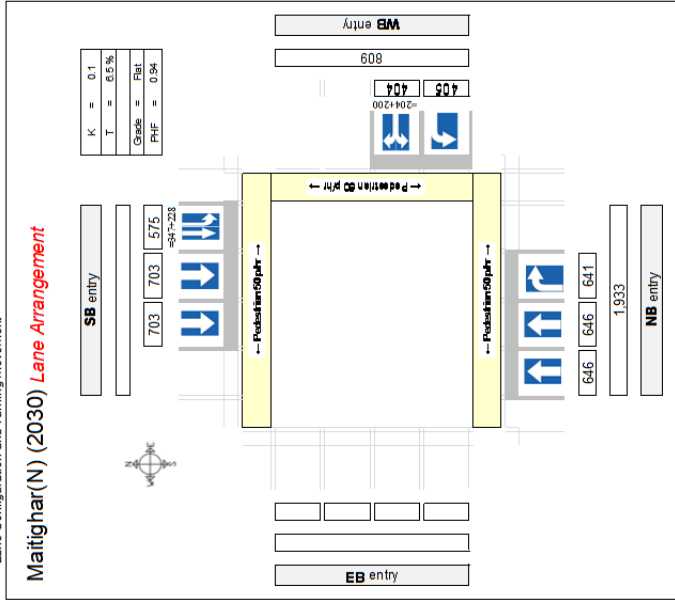
4.2 Maitighar (N) Signalized Intersection (2030: Without case) Additional Lane Arrangement

Calculation result of intersections (Maitighar(N) Intersection)

Name of Intersection	Maitighar(N) Add-Lane		1 φ	2 φ	3 φ	4 φ	5 φ	6 φ
Target year	2030 peak/hour		47	35	4	30	4	
			C (Cycle time)					
			120					
			Lane width					
			3.50					
								Heavy vehicle ratio (%)
								6.5

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Lane Configuration and Turning movement



Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry	
	Left-Through	Through	Left-Turn	Left-Right	Through	Right-Through	Through	Through
Number of lane	1	2	1	1	2	1	1	1
Basic value (saturation flow rate) : S_0	1,900	2,000	1,900	1,900	2,000	1,900	1,900	1,900
Adjustment factor for lane width : λ_{vw}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for lane width : λ_w	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : λ_{ag}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(green time for approach grade) : λ_{ag}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for heavy vehicles : λ_H	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
(ratio of heavy vehicles) : λ_H	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Adjustment factor for bus-stop	-	-	-	-	-	-	-	-
Adjustment factor for left turn : λ_{LT}	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(ratio of left turn vehicles)	36.7							
L %	0.15							
(decrease ratio of pedestrians)	47							
G sec	42							
(effective green time)	25							
G_p sec	42							
(green time for pedestrians)	25							
E_{LT}	1.27							
(through vehicle equivalent for left turn vehicles)	12.808							
Adjustment factor for right turn	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(ratio of right turn vehicles)	0.00							
R %	0.00							
(probability of right turn)	3							
(vehicle making turns at transfer phases) K	> 1,000							
(volume of opposite through traffic) q	644							
(saturation flow rate of opposite approach) S_0								
(through vehicle equivalent for right turn vehicles) E_{RT}								
Saturation flow rate	1,647	3,840	0	1,596	1,824	0	3,840	1,824
Traffic volume : Right turn traffic volume				200				
(heavy vehicle ratio)				6.50				
Through traffic volume	347	1,406			1,063	641		
(heavy vehicle ratio)	6.50	6.50			6.50	6.50		
Left turn traffic volume	228		405	204				
(heavy vehicle ratio)	6.50		6.50	6.50				
Total traffic volume : q	575	1,406	0	405	0	1,063	641	0
(heavy vehicle ratio)	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Traffic volume : q	575	1,406	0	405	0	1,063	641	0
Flow ratio	0.349	0.366		0.254		0.277	0.366	0.366
Necessary phase ratio	1 φ	0.349	0.366	0.221		0.277	0.349	0.366
2 φ								
3 φ								
4 φ								
5 φ								
6 φ								
Saturation degree of phase	0.366	0.366		0.254		0.277	0.366	0.366
Saturation degree of intersection	0.620							0.620

Excellent

Queues = pc/cycle

Queues = pc/cycle

Queues = pc/cycle

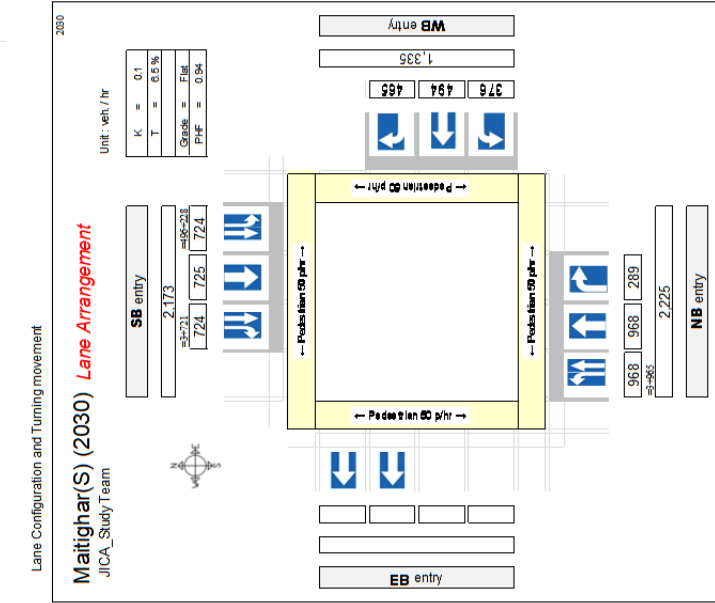
Queues = pc/cycle

5.2 Maitighar (S) Signalized Intersection (2030: Without case) Additional Lane Arrangement

Calculation result of Intersections (Maitighar(S) Intersection)

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Approaches	Maitighar(S) Add-Lane		C (Cphs time)		1φ		2φ		3φ		4φ		5φ		6φ	
	Left-Through	Through	Left-Turn	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn
Name of Intersection	Maitighar(S) Add-Lane															
Target year	2030 peak/hour															
Lane	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1															
Number of lane	2,000 2,000 1,900 2,000 2,000 2,000 1,900 2,000 2,000 2,000 1,900 2,000 2,000 2,000 2,000 1,900															
Basic value disaburton flow rate : S_b	1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00															
Adjustment factor for lane width : Q_w	3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50															
Adjustment factor for approach grade : Q_g	1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00															
(green time for approach grade) : %	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00															
Adjustment factor for heavy vehicles : Q_r	0.96 0.96 0.96 0.96 0.96 0.96 0.96 0.96 0.96 0.96 0.96 0.96 0.96 0.96 0.96 0.96															
(ratio of heavy vehicles) : %	6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50															
Adjustment factor for bus-stop : Q_{bs}	-															
Adjustment factor for left turn (ratio of left turn vehicles) : Q_{LT}	0.92 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00															
(decrease ratio of pedestrians) : f_p	315 100.0 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15															
(effective green time) : G_{sec}	47 30 47 30 47 30 47 30 47 30 47 30 47 30 47 30															
(green time for pedestrians) : $G_{p, sec}$	42 25 42 25 42 25 42 25 42 25 42 25 42 25 42 25															
(through vehicle equivalent for left turn vehicles) : E_{LT}	1.27 415.63															
Adjustment factor for right turn (ratio of right turn vehicles) : $R\%$	1.00 1.00 0.98 1.00 0.98 1.00 0.98 1.00 0.98 1.00 0.98 1.00 0.98 1.00 0.98 1.00															
(probability of right turn) : f	0.41 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00															
(vehicle making turns at transfer phases) : K	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3															
(volume of opposite through traffic) : q	> 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000 > 1,000															
(saturation flow rate of opposite approach) : S_k	6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42 6.42															
(through vehicle equivalent for right turn vehicles) : E_{RT}	-															
Saturation flow rate : S_A	1,769 1,920 1,878 1,596 1,920 1,824 465 6.50 496 725 721 6.50 6.50 6.50 6.50 6.50															
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	3 6.50 721 6.50 721 6.50 721 6.50 721 6.50 721 6.50 721 6.50 721 6.50															
Through traffic volume (heavy vehicle ratio)	496 725 721 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50 6.50															
Left turn traffic volume (heavy vehicle ratio)	228 6.50 724 725 724 725 724 725 724 725 724 725 724 725 724 725															
Total traffic volume : q	724 725 724 725 724 725 724 725 724 725 724 725 724 725 724 725															
Traffic volume	0.409 0.378 0.386 0.236 0.257 0.255 0.506 0.504 0.505 0.504 0.505 0.504 0.505 0.504 0.505 0.504															
Flow ratio	1φ 2φ 3φ 4φ 5φ 6φ															
Necessary phase ratio	0.409 0.378 0.386 0.236 0.257 0.255 0.506 0.504 0.505 0.504 0.505 0.504 0.505 0.504 0.505 0.504															
Level crossing open ratio (%) = 100%	-															
D. EB entry	-															
C. NB entry	-															
B. WB entry	-															
A. SB entry	-															



Saturation degree of phase	0.505
Saturation degree of intersection	0.000
	0.000
	0.257
	0.000
	0.762
	Excellent

5.3 Maitighar (S) Roundabout Intersection (2030: Without case) Current Lane Arrangement

Calculation result of intersections (Maitighar(S) Intersection) Roundabout Intersection

Unit: pc/htr

$P_v = 0.85$, $P_r = 0.85$, $P_{FR} = 0.04$

		WB-entry (East side)			SB-entry (North side)			EB-entry (West side)			NB-entry (South side)		
		Vehicle	Motorcycle	Truck	Vehicle	Motorcycle	Truck	Vehicle	Motorcycle	Truck	Vehicle	Motorcycle	Truck
Q1	Vehicle	0	0	0	0	0	0	0	0	0	0	0	
Q2	Vehicle	0	0	0	0	0	0	0	0	0	0	0	
Q3	Vehicle	0	0	0	0	0	0	0	0	0	0	0	
Q4	Vehicle	0	0	0	0	0	0	0	0	0	0	0	
QK1	Vehicle	0	0	0	0	0	0	0	0	0	0	0	
QK2	Vehicle	0	0	0	0	0	0	0	0	0	0	0	
QK3	Vehicle	0	0	0	0	0	0	0	0	0	0	0	
QK4	Vehicle	0	0	0	0	0	0	0	0	0	0	0	
Remarks: ΔNC : If there is an independent bypass here, traffic conflict is not occur, so the flow rate of the left turn will be 0 pc/htr.													

Foot	Dir	Traffic Movement	Heavy vehicle Ratio P _v	Adjustment Factor for HV flow	Peak Hour Factor	Pedestrian Crossing
V		Vehicle	0.5			
P _v		%	0.5			
Cr		Adjustment Factor for HV flow		0.85	0.84	
PHF		Peak Hour Factor		0.84	0.84	
P/Cross		Pedestrian Crossing				0

Step	PHF	Movement Demand Volume	V _{max}	Exit Lane F/R	Entry F/R	Capacity of Entry Lane with Cr	Pedestrian (pedestrian flow)	Convert Capacity of Lane	Convert Entry Lane Flow Rate	VC Ratio	Average Control Delay	LOS for Lane	Average Control Delay and LOS for Approach RA	LOS for Approach and Entire RA	95% Percentile Queue for Lane
Step 1	PHF	Movement Demand Volume	2301	348	9102	468	0.893	427	690	2.80	737.2	A	734.2	A	51.7
Step 2	PHF	Adjustment F/R for HV	0.84	0.84	0.84	427	0.893	400	690	3.50	873.7	F	608.4	F	52.8
Step 3	V _{max}	Circle Lane F/R	2301	348	9102	468	0.893	427	690	2.80	737.2	A	734.2	A	51.7
Step 4	V _{max}	Exit Lane F/R	690	348	9102	468	0.893	427	690	2.80	737.2	A	734.2	A	51.7
Step 5	V _{max}	Entry F/R	690	348	9102	468	0.893	427	690	2.80	737.2	A	734.2	A	51.7
Step 6	Cr	Capacity of Entry Lane with Cr	690	348	9102	468	0.893	427	690	2.80	737.2	A	734.2	A	51.7
Step 7	Cr	Convert Capacity of Lane	690	348	9102	468	0.893	427	690	2.80	737.2	A	734.2	A	51.7
Step 8	V _{max}	Convert Entry Lane Flow Rate	690	348	9102	468	0.893	427	690	2.80	737.2	A	734.2	A	51.7
Step 9	X _{max}	VC Ratio	2.80	3.50	1.26	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Step 10	d _{avg}	Average Control Delay	737.2	144.2	30.5	737.2	737.2	737.2	737.2	737.2	737.2	737.2	734.2	734.2	734.2
Step 11	LOS _{lane}	LOS for Lane	A	F	F	A	A	A	A	A	A	A	A	A	A
Step 12	Q ₉₅	95% Percentile Queue for Lane	51.7	52.8	0.0	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7

6.1 Thapathali Signalized Intersection (2030: Without case) Current Lane Arrangement

Calculation result of intersections (Thapathali Intersection)

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Name of Intersection	Thapathali Current Lane			
Target year	2030	peak/hour	120	C (Cpk-time)
Lane width	3.50	Heavy vehicle ratio (%)	5.4	

Approaches	A. SB entry	B. WB entry	C. NB entry	D. EB entry	Level crossing open ratio (%) = 100%
Lane	Left-Through 1 2,000	Left-R 1 2,000	Through 1 2,000	Left Turn 1 1,900	Through+Right 1 2,000
Number of lane	1	1	1	1	1
Basic value disaburton flow rate : S_0	2,000	2,000	2,000	2,000	2,000
Adjustment factor for lane width : W_1	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : G_1	3.50	3.50	3.50	3.50	3.50
Adjustment factor for heavy vehicles : H_1	0.96	0.96	0.96	0.96	0.96
Adjustment factor for bus-stop : B_1	5.40	5.40	5.40	5.40	5.40
Adjustment factor for left turn (ratio of left turn vehicles) : L_1	0.15	0.15	0.15	0.15	0.15
(decrease ratio of pedestrians)	30	30	30	30	30
(effective green time)	25	25	25	25	25
(green time for pedestrians)	1.26	1.26	1.26	1.26	1.26
(though vehicle equivalent for left turn vehicles)					
Adjustment factor for right turn (ratio of right turn vehicles) : R_1	0.68	0.68	0.68	0.68	0.68
(probability of right turn)	3	3	3	3	3
(vehicle making turns at transfer phases) K	>1,000	>1,000	>1,000	>1,000	>1,000
(volume of opposite through traffic) q	644	644	644	644	644
(saturation flow rate of opposite approach) S_0	5.50	5.50	5.50	5.50	5.50
(though vehicle equivalent for right turn vehicles) E_{RT}	1,916	1,920	1,920	1,924	1,924
Saturation flow rate	1,916	1,920	1,920	1,924	1,924
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	0	0	0	0	0
Through traffic volume (heavy vehicle ratio)	1,151	1,151	1,151	1,151	1,151
Left turn traffic volume (heavy vehicle ratio)	10	10	10	10	10
Total traffic volume : q	1,161	1,161	1,161	1,161	1,161
Traffic volume (heavy vehicle ratio)	1,161	1,161	1,161	1,161	1,161
Flow ratio	1.00	1.00	1.00	1.00	1.00
Necessary phase ratio	1.00	1.00	1.00	1.00	1.00

Thapathali (2030) Current Lane Arrangement
JICA_Study Team

Unit: veh./hr

SB entry: 2,321 (Left Turn: 1,160, Right Turn: 1,161)
WB entry: 2,000 (Left Turn: 1,900, Right Turn: 1,000)
NB entry: 1,920 (Left Turn: 1,824, Right Turn: 996)
EB entry: 1,924 (Left Turn: 1,824, Right Turn: 1,000)

Saturation degree of phase	0.606	0.606	0.606	0.606
Saturation degree of intersection	0.606	0.606	0.606	0.606
Queue = pcu/cycle	1.229	1.229	1.229	1.229
Queue = pcu/cycle	3.053	3.053	3.053	3.053

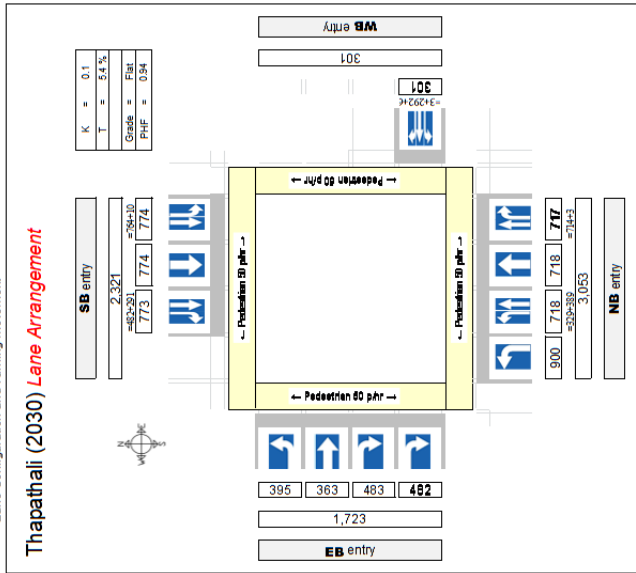
No good

6.2 Thapathali Signalized Intersection (2030: Without case) Additional Lane Arrangement

Calculation result of intersections (Thapathali Intersection)

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Name of Intersection	Thapathali Add-Lane					
Target year	2030 peak hour					
	C (Cycle time)	1 φ	2 φ	3 φ	4 φ	5 φ
	120	30	35	4	27	20
						4
						Y&AR
						Y&AR
						Y&AR



Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry		Level crossing open ratio (%) = 100%
	Left-Through	Through-Right	L+T+R	Left-Through	Through-Right	Left-Through	Through-Right	Left-Through	
Number of lane	1	1	1	1	1	1	1	1	2
Basic value of saturation flow rate : S ₀	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,900
Adjustment factor for lane width : d _w	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(lane width) m	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : d _g	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(approach grade) %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjustment factor for heavy vehicles : d _r	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
(ratio of heavy vehicles) %	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
Adjustment factor for bus-stop : d _{bs}	-	-	-	-	-	-	-	-	-
Adjustment factor for left turn (ratio of left turn vehicles) L %	0.97	1.00	0.88	1.00	1.00	0.89	1.00	1.00	1.00
(decrease ratio of pedestrians) f _p	1.3		1.0		1.00	45.0		100.00	
(effective green time) G sec.	30		27		30	30		27	
(green time for pedestrians) G _p sec.	25		22		25	25		22	
(through vehicle equivalent for left turn vehicles) E _{LT}	126		126		126	126		126	
(through vehicle equivalent for right turn vehicles) E _{RT}	395		395		416	554		317	
Adjustment factor for right turn (ratio of right turn vehicles) R %	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	1.00
(probability of right turn) f	0.0		2.0		0.00	45.0		0.0	
(vehicle making turns at transfer phases) K	3		3		3			3	
(volume of opposite through traffic) q	> 1,000		383		> 1,000			> 1,000	
(saturation flow rate of opposite approach) S ₀	2 φ		554		2 φ	644		644	
(through vehicle equivalent for right turn vehicles) E _{RT}	559		287		554			5 φ	
Saturation flow rate : S _a	1,914	1,920	1,920	1,920	1,920	1,920	1,920	1,920	1,920
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	0		6		0			0	
(heavy vehicle ratio)	5.40		5.40		5.40			5.40	
Through traffic volume (heavy vehicle ratio)	764	774	291	389	718	714	714	363	363
(heavy vehicle ratio)	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
Left turn traffic volume (heavy vehicle ratio)	10		3		900			78	
(heavy vehicle ratio)	5.40		5.40		5.40			5.40	
Total traffic volume (heavy vehicle ratio)	774	774	291	900	718	714	714	363	363
(heavy vehicle ratio)	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
Traffic volume : q	0.404	0.403	0.152	0.185	0.418	0.374	0.372	0.189	0.189
Flow ratio : p	0.404	0.403	0.152	0.185	0.418	0.374	0.372	0.189	0.189
Necessary phase ratio	1 φ+2 φ		970		900-970 OK			0.418	
	2 φ							0.000	
	3 φ							0.000	
	4 φ							0.189	
	5 φ							0.000	
	8 φ							1.050	
								664<1050 OK	
Saturation degree of phase								0.043	0.189
Saturation degree of intersection									0.607
Queues = p/cycle									
Queues = p/cycle									
Queues = p/cycle									
Queues = p/cycle									
Queues = p/cycle									
Queues = p/cycle									

Excellent

7.1 Tripureshwar Signalized Intersection (2030: Without case) Current Lane Arrangement

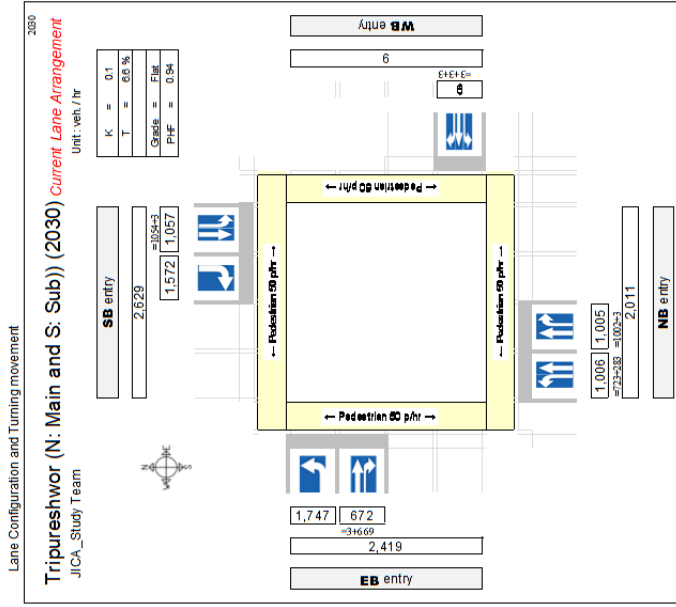
Calculation result of intersections (Tripureshwar Intersection)

Name of Intersection	Tripureshwar Current Lane			
Target year	2030 peak/hour			
	1φ	2φ	3φ	4φ
	20	50	4	20
	Y&AR		Y&AR	
	Y&AR		Y&AR	

Lane width	3.50
Heavy vehicle ratio (%)	6.6

xxx

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977



Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry	
	Left-Through	Right Turn	L+T+R	Left-Through	Right-Through	Left-Through	Right-Through	
Lane	1	1	1	1	1	1	1	
Number of lane	1,900	1,900	2,000	2,000	2,000	2,000	2,000	
Basic value disablation flow rate : S_0	1,000	1,000	1,000	1,000	1,000	1,000	1,000	
Adjustment factor for lane width : 0_{w_1}	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
Adjustment factor for approach grade : 0_{g_1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Adjustment factor for heavy vehicles : 0_{r_1}	0.96	0.96	0.96	0.96	0.96	0.96	0.96	
Adjustment factor for bus-stop : 0_{bs}	6.60	6.60	6.60	6.60	6.60	6.60	6.60	
Adjustment factor for left turn (ratio of left turn vehicles) : 0_{L_1}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
(decrease ratio of pedestrians) : f_p	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
(effective green time) : G_{sec}	20	20	20	20	20	20	20	
(green time for pedestrians) : $G_{p, sec}$	15	15	15	15	15	15	15	
(though vehicle equivalent for left turn vehicles) : E_{LT}	1.24	1.24	1.24	1.24	1.24	1.24	1.24	
Right Turn	296	296	833	833	5φ	348	348	
Adjustment factor for right turn (ratio of right turn vehicles) : 0_{R_1}	1.00	1.00	1.00	1.00	0.99	1.00	1.00	
(probability of right turn) : f_r	0	0	0.00	0.00	0.00	0.00	0.00	
(vehicle making turns at transfer phases) : K	3	3	3	3	3	3	3	
(volume of opposite through traffic) : q	>1,000	>1,000	>1,000	>1,000	>1,000	>1,000	>1,000	
(saturation flowrate of opposite approach) : S_0	90	822	822	822	822	822	822	
(though vehicle equivalent for right turn vehicles) : E_{RT}	1φ	2φ	0.96	0.96	3.67	3.67	0.86	
Saturation flow rate : S_0	1,919	1,824	1,704	1,638	1,905	1,824	1,920	
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	1,572	660	3	3	660	660	660	
Through traffic volume (heavy vehicle ratio)	1,054	660	283	1,002	660	660	660	
Left turn traffic volume (heavy vehicle ratio)	3	3	0	0	1,399	660	660	
Total traffic volume : q	1,057	1,572	9	0	283	1,005	672	
Traffic volume (heavy vehicle ratio)	660	660	660	660	660	660	660	
Flow ratio : q	1,057	1,572	0	0	283	1,005	672	
Flow ratio : p	0.551	0.551	0.005	0.005	0.173	0.528	0.350	
Necessary phase ratio : $2φ$	912	912	0.173	0.173	0.528	0.528	0.528	
Flow ratio : $3φ$	1572-912	See below I	0.005	0.005	0.005	0.005	0.005	
Flow ratio : $4φ$								
Flow ratio : $5φ$								
Flow ratio : $6φ$								
During the peak hours, a slight congestion occurs in the SB right turn lane.								
Right Turn	Queues = 22 vehicle/cycle		Queues = pair/cycle		Queues = pair/cycle		Queues = pair/cycle	

No Good

7.2 Tripureshwar Signalized Intersection (2030: Without case) Additional Lane Arrangement

Calculation result of Intersections (Tripureshwar Intersection)

xxx

Name of Intersection	Tripureshwar Add-Lane					
Target year	2030 peak-hour					
	1φ	2φ	3φ	4φ	5φ	6φ
Lane width	20	50	4	20	22	4
Heavy vehicle ratio (%)	6.6					



Approaches	A. SB entry		B. WB entry		C. NB entry		D. EB entry		Level crossing open ratio (%) = 100%
	Left-Turn	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	
Number of lane	1	2	1	1	1	1	1	1	1
Basic value disaburion flow rate : S_0	2,000	1,900	2,000	2,000	2,000	1,900	2,000	2,000	1,900
Adjustment factor for lane width : W_0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for approach grade : G_0	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Adjustment factor for approach grade : G_0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjustment factor for heavy vehicles : H_0	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adjustment factor for bus-stop : B_0	6.60	6.60	6.60	6.60	6.60	6.60	6.60	6.60	6.60
Adjustment factor for left turn (ratio of left turn vehicles) : L_0	0.99	1.00	0.89	1.00	1.00	0.89	1.00	0.81	1.00
(decrease ratio of pedestrians) : P_0	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
(effective green time) : G_0 sec	20	20	20	20	20	20	20	20	20
(green time for pedestrians) : G_p sec	15	15	15	15	15	15	15	15	15
(though vehicle equivalent for left turn vehicles) : E_{LT}	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Adjustment factor for right turn (ratio of right turn vehicles) : R_0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(probability of right turn) : P_0	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
(vehicle making turns at transfer phases) : K_0	3	3	3	3	3	3	3	3	3
(volume of opposite through traffic) : Q_0	>1,000	>1,000	>1,000	>1,000	>1,000	>1,000	>1,000	>1,000	>1,000
(saturation flow rate of opposite approach) : S_0	90	1,613	90	1,613	90	1,613	90	1,613	90
(though vehicle equivalent for right turn vehicles) : E_{RT}	1φ	2φ	1φ	2φ	1φ	2φ	1φ	2φ	1φ
Saturation flow rate : S_0	1,919	3,648	0	1,704	0	1,619	1,920	1,619	1,550
Traffic volume : Right turn traffic volume (heavy vehicle ratio)	1,572	660	3	660	3	660	660	660	660
Through traffic volume (heavy vehicle ratio)	1,054	660	644	644	644	644	644	644	644
Left turn traffic volume (heavy vehicle ratio)	660	660	660	660	660	660	660	660	660
Total traffic volume : q (heavy vehicle ratio)	3	660	660	660	660	660	660	660	660
Traffic volume : q (heavy vehicle ratio)	1,057	1,572	0	9	0	723	644	644	669
Flow ratio : p	0.551	0.431	0.005	0.447	0.335	0.447	0.335	0.325	0.340
Necessary phase ratio	1φ	0.551	0.005	0.447	0.335	0.447	0.335	0.325	0.340
	2φ	1.703		723-792 OK	0.335	723-792 OK	0.335		
	3φ	1572-1703 OK							
	4φ								
	5φ								
	6φ								

Good

Queues = paucycle

Queues = paucycle

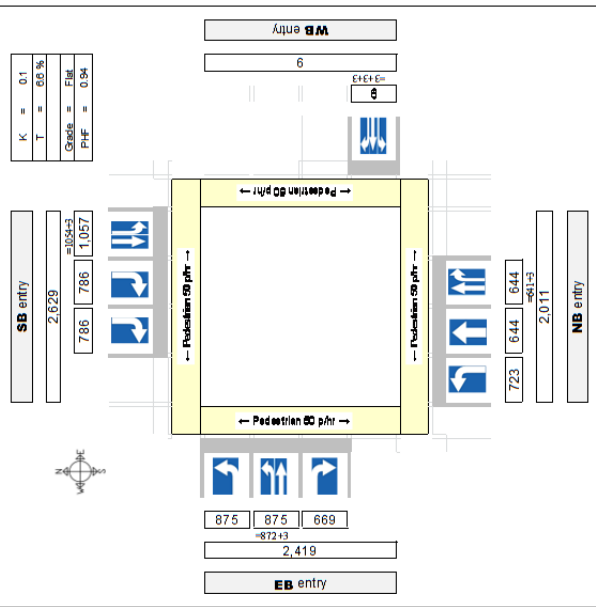
Queues = paucycle

Queues = paucycle

Calculation Form of Japan Society of Traffic Engineers (JSTE) 1977

Lane Configuration and Turning movement

Tripureshwar (N: Main and S: Sub) (2030) Lane Arrangement



Saturation degree of phase	0.551
Saturation degree of intersection	0.903

7.3 Tripureshwor Roundabout Intersection (2030: Without case) Current Lane Arrangement

Calculation result of intersections (Tripureshwor Intersection) Roundabout Intersection

Unit: pcu/hr

$P_c = 0.05$, $P_v = 0.05$, $P_{FB} = 0.04$

Year	WB-entry (East side)			EB-entry (North side)			EB-entry (West side)			NB-entry (South side)		
	Year	Volume	Flow	Year	Volume	Flow	Year	Volume	Flow	Year	Volume	Flow
01	Year	3 rd Grade										
02	Year	2 nd Grade										
03	Year	1 st Grade										
04	Year	4 th Grade										
05	Year	2 nd Grade										
06	Year	1 st Grade										
07	Year	4 th Grade										
08	Year	3 rd Grade										
09	Year	Roundabout										

Step 1: Traffic Movement

Flow	Volume	Flow	Flow	Flow	
WB-entry	90	EB-entry	90	EB-entry	90
EB-entry	90	NB-entry	90	NB-entry	90

Step 2: Adjustment FFR for HV

Flow	Volume	Flow	Flow	Flow	
WB-entry	4.024	EB-entry	8.50	EB-entry	1.422
EB-entry	2.009	NB-entry	2.107	NB-entry	1.631

Step 3: Capacity of Entry Lane with E_v

Flow	Volume	Flow	Flow	Flow	
WB-entry	88	EB-entry	95	EB-entry	95
EB-entry	95	NB-entry	95	NB-entry	95

Step 4: Provision (provisional flow)

Flow	Volume	Flow	Flow	Flow	
WB-entry	0.893	EB-entry	0.893	EB-entry	0.893
EB-entry	0.893	NB-entry	0.893	NB-entry	0.893

Step 5: Convert Capacity of Lane

Flow	Volume	Flow	Flow	Flow	
WB-entry	83	EB-entry	81	EB-entry	81
EB-entry	81	NB-entry	81	NB-entry	81

Step 6: Current Entry Lane Flow Rate

Flow	Volume	Flow	Flow	Flow	
WB-entry	4	EB-entry	4	EB-entry	4
EB-entry	4	NB-entry	4	NB-entry	4

Step 7: V/C Ratio

Flow	Volume	Flow	Flow	Flow	
WB-entry	0.08	EB-entry	0.08	EB-entry	0.08
EB-entry	0.08	NB-entry	0.08	NB-entry	0.08

Step 8: Average Control Delay

Flow	Volume	Flow	Flow	Flow	
WB-entry	81.0	EB-entry	79.4	EB-entry	79.4
EB-entry	79.4	NB-entry	79.4	NB-entry	79.4

Step 9: LOS for Lane

Flow	Volume	Flow	Flow	Flow	
WB-entry	81.0	EB-entry	81.0	EB-entry	81.0
EB-entry	81.0	NB-entry	81.0	NB-entry	81.0

Step 10: Average Control Delay and LOS for Approach

Flow	Volume	Flow	Flow	Flow	
WB-entry	46.0	EB-entry	46.0	EB-entry	46.0
EB-entry	46.0	NB-entry	46.0	NB-entry	46.0

Step 11: LOS for Approach and Entire RA

Flow	Volume	Flow	Flow	Flow	
WB-entry	166.7	EB-entry	166.7	EB-entry	166.7
EB-entry	166.7	NB-entry	166.7	NB-entry	166.7

Step 12: 95% Percentile Queue for Lane

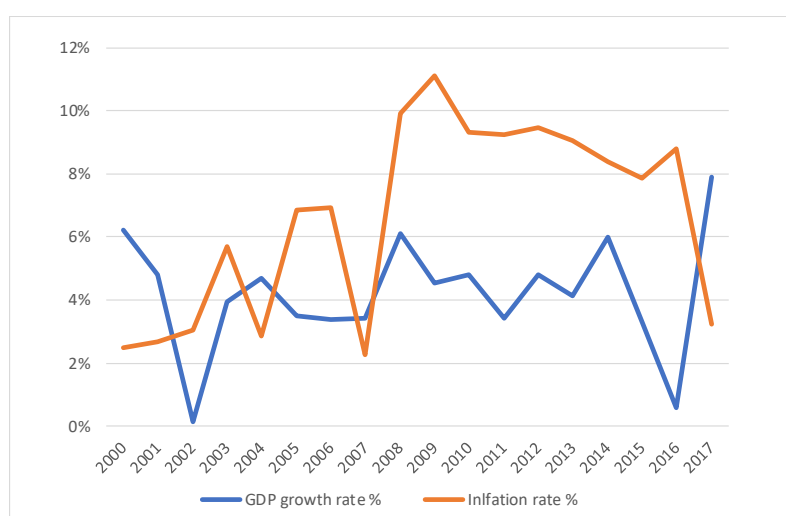
Flow	Volume	Flow	Flow	Flow	
WB-entry	0.2	EB-entry	0.2	EB-entry	0.2
EB-entry	0.2	NB-entry	0.2	NB-entry	0.2

Appendix 7 Financial Capacity

APPENDIX 7 FINANCIAL CAPACITY

7.1 Economic Background

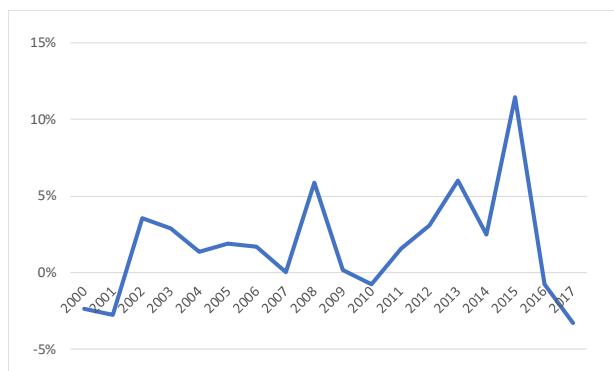
Nepal has shown continued economic growth over the past ten years, with an average GDP growth rate of 4.6% (2008-2017), supported by the strong manufacturing and tourism-related sectors. As shown in Figure 7.1, in 2017, the GDP reached US\$24.88 billion, with a growth rate of 7.9%, GDP per capita at US\$849, and inflation rate of 3.2%. According to IMF, the near-term outlook for economic growth is favorable, although macroeconomic and financial vulnerabilities need to be monitored continuously. GDP growth is expected at 6.5% in FY2018 (mid-July 2018 to mid-July 2019), supported by ongoing reconstruction works after the 2015 earthquake, investment in hydro-power projects, and strong tourism-related activities.



Source: The World Bank

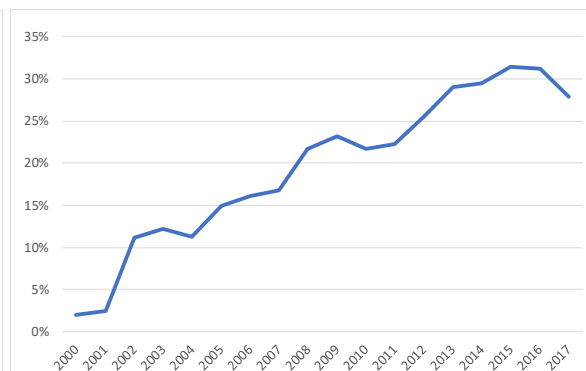
Figure 7.1 GDP Growth and Inflation Rate

The current account balance as % of GDP is shown in Figure 7.2. In the past ten years, the current account balance has been in surplus in the majority of the years, reaching an all-time high in the first quarter of 2015 at 86.6 billion NPR supported by the large remittance inflows. However, recently it has shown a sharp fall and recorded a deficit of -74.8 billion NPR, led by an increasing trade deficit, from large imports. As shown in Figure 7.3, Nepal's remittance inflows have grown 10.2% in FY2017, the amount equivalent to 27.9% of Nepal's GDP, boosting the consumption and imports to the country.



Source: The World Bank

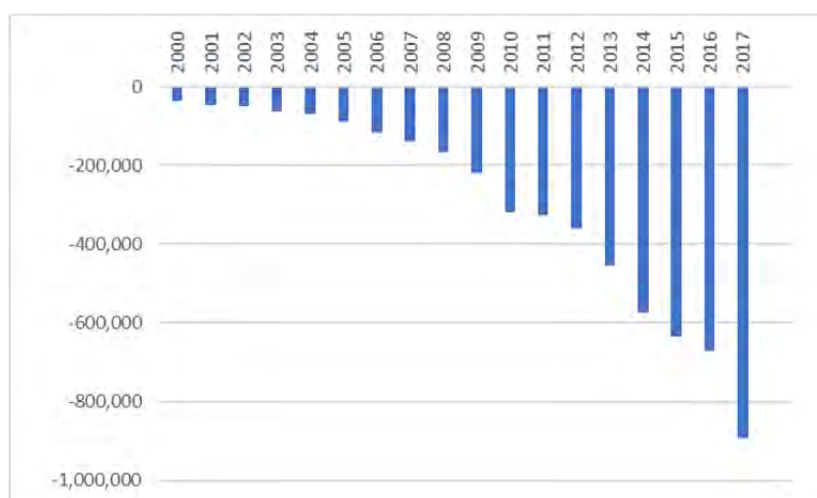
Figure 7.2 Current Account Balance (% of GDP)



Source: The World Bank

Figure 7.3 Remittance Inflows (% of GDP)

The trade deficit (export minus import), as shown in Figure 7.4, has been expanding year by year, due to the increase in imports from the expansion of consumption supported by the buoyant remittance inflows. Nepal's major export partner is India, with a share of more 57%, followed by the United States with 11%, and Turkey with 6% (2017 figures). Its major import partner is also India, with a 64% share, followed by China at 12% (2017 figures). Major exported products include textiles and clothing (44%), vegetables (14%), and food products (12%) and major imported products include machines and electronics, (15%), fuel (15%), metals (12%) and vegetables (12%). It could be said that the Nepalese economy is in the stage of structural transformation as the share of service sector is increasing, while that of agriculture sector is decreasing. The share of agriculture and non-agriculture sectors to GDP has been at 29% and 70% respectively in FY2016.



Source: The World Bank

Figure 7.4 Import and Export Balance (million NPR)

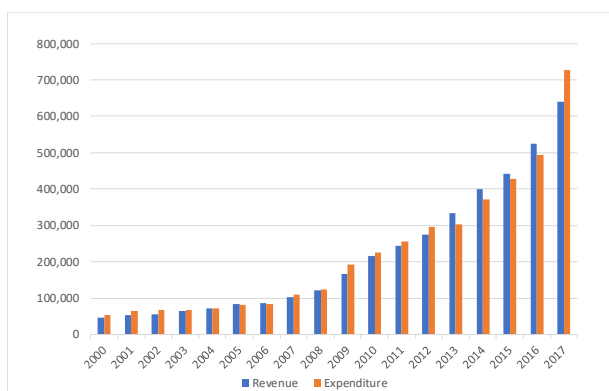
7.2 Financial Situation of the Government of Nepal

7.2.1 Government Revenue and Expenditure

Overall, Nepal's finances have been relatively sound. As shown in Figure 7.5 and Figure 7.6, the fiscal balance in Nepal was in deficit (expenditure larger than revenue) from year FY2000 to FY2012, but with increase in revenue largely due to increase in remittances. The fiscal balance became a surplus from FY2013 to FY2016, until a sharp drop in FY2017 due to a significant increase in government expenditure.

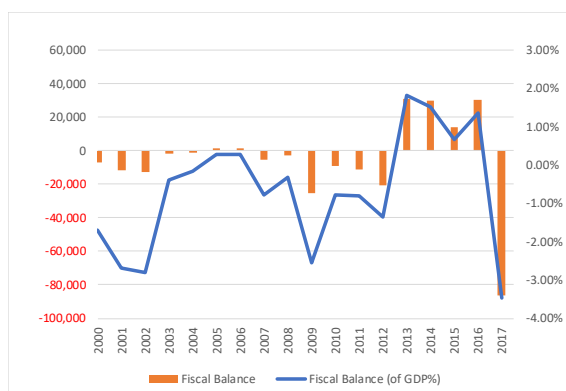
Government expenditure has been increasing over the years, from around 13% of GDP in the early 2000s to more than 20% of GDP since FY2015. In FY2017, the expenditure increased by 32.4% year-on-year to NPR 727,280 million, propelled by Nepal’s transition to fiscal federalism and ongoing reconstruction spending. As in previous years, spending was concentrated in the last quarter of the fiscal year.

Government revenue has also been increasing to more than 20% of GDP since FY 2014. Growth in tax revenues has been steady in terms of revenue, this is due to the increase in import-related tax revenues, from increased remittances after the end of the civil war in 2006, along with the government’s plans and tax reforms, strengthening of customs control by the fiscal authorities and the Internal Revenue Service.



Source: IMF – Government Finance Statistics (GFS) Data

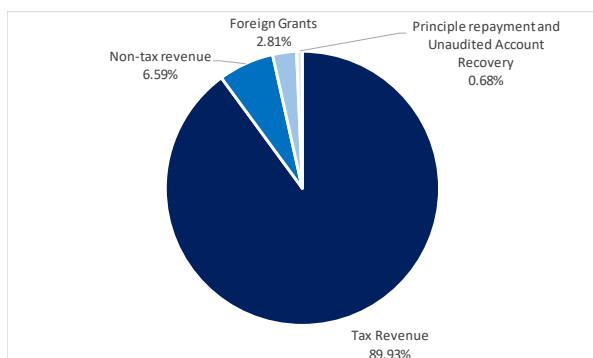
Figure 7.5 Revenue and Expenditure (million NPR)



Source: IMF – Government Finance Statistics (GFS) Data

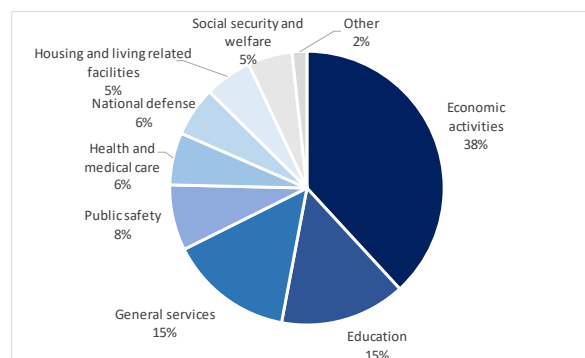
Figure 7.6 Fiscal Balance (million NPR)

Furthermore, Figure 7.7 and Figure 7.8 show the breakdown of the government revenues and expenditures, respectively. It shows that the government revenue is supported by tax and non-tax revenue (97%), as well as foreign grants and repayments (3%). However, the contribution of foreign grants to the government’s total income has been gradually declining since FY2012. Majority of expenditures are utilized for economic activities (38%), education (15%) and general services (15%).



Source: IMF – Government Finance Statistics (GFS) Data

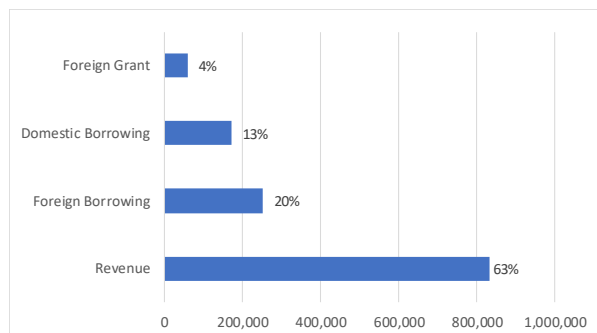
Figure 7.7 Revenue Breakdown FY2016



Source: IMF – Government Finance Statistics (GFS) Data, Economic Survey by Ministry of Finance

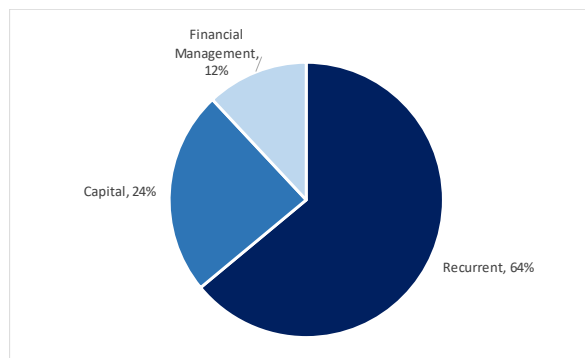
Figure 7.8 Expenditure Breakdown FY2017

The government’s FY2018 budget of NPR 1.31 trillion has been set, with a target of 8% economic growth and 29.8% revenue growth. The federal budget allocated NPR 113.43 billion to seven provinces and NPR 195.05 billion to 753 local bodies and under the revenue-sharing scheme, the provinces and local bodies have received NPR 60.42 billion and NPR 53.82 billion, respectively, from the divisible fund. In terms of the sources of budget, foreign borrowing and foreign grant for FY2018 account for 24% of the total budget, as shown in Figure 7.9. It also should be noted that the recurrent expenditure in Nepal makes up more than 60% of total government spending. In contrast, capital expenditure remains below 20%, as shown in Figure 7.10.



Source: Nepal Economic Forum

Figure 7.9 Source of Budget Financing FY2018

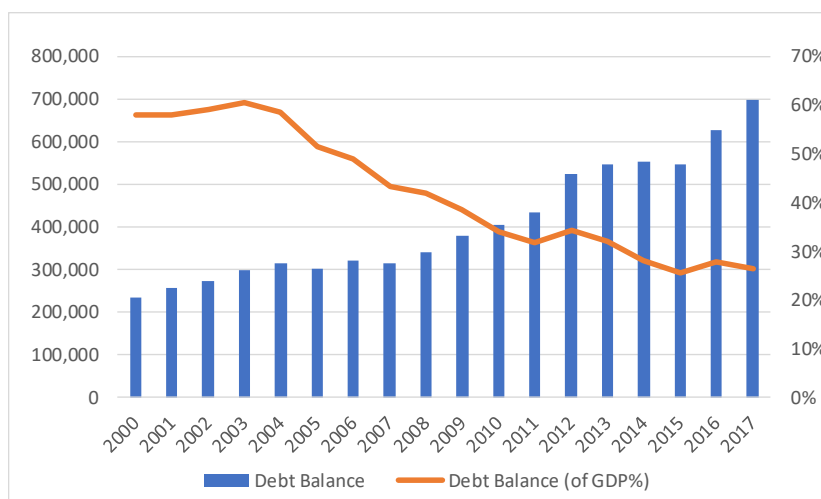


Source: Nepal Economic Forum

Figure 7.10 Allocation of Budget FY2018

7.2.2 Debt Balance

In Nepal, public debt grew rapidly since the 1980s and reached 50-60% of GDP in the 1990s and early 2000s. However, as shown in Figure 7.11, with the recovery of the fiscal deficit trend (excluding the case of recent years) and the government policy on promoting public debt repayment, the debt balance has improved significantly, to 26.4% of GDP in 2017.



Source: IMF – Government Finance Statistics (GFS) Data

Figure 7.11 Debt Balance (million NPR)

According to IMF’s Article IV consultation (debt sustainability analysis), shown in Table 7.1, Nepal’s risk of external debt distress remains low and under the IMF/World Bank Debt Sustainability Analysis Framework for Low Income Countries (LIC-DSF), all debt and debt service ratios are projected to remain below relevant indicative threshold values. However, following a prolonged decline, a rise in total public debt is projected, to about 35% of GDP in the medium term and about 42% of GDP in the long term, owing to continuing fiscal and current account deficits, as the authorities implement fiscal federalism and aim to put the economy on a higher growth path.

Table 7.1 IMF – Debt Sustainability Analysis 2018

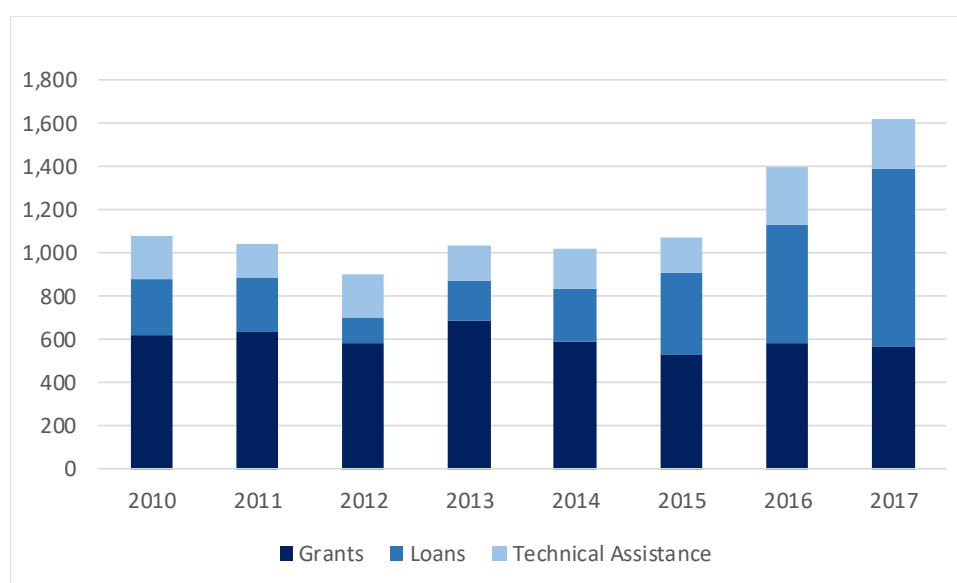
Risk of External Debt Distress	Low
Overall Risk of Debt Distress	Low

7.2.3 Donor Assistance

The Ministry of Finance recognizes that international finance among the public finance, including foreign direct investment, remittance and official development assistance (ODA), plays a key role in socioeconomic development. There are four types of classifications of foreign aid related to the national budget, as follows¹:

- On-Budget: Funds that are reflected in the Government’s annual budget book
- Off-Budget: Funds are not reflected in the Government’s annual budget book
- On-Treasury: Funds channeled through the Government’s treasury system
- Off-Treasury: Funds not channeled through the Government’s treasury system

In the past, major source of development expenditure used to be foreign aid. Currently, it is around 20% of the national budget. Figure 7.12 shows the ODA disbursement situation from FY2010 to FY2018. Of the total ODA in FY2017, the shares of grants, loan and technical assistance accounted for 35%, 50%, 14% respectively.

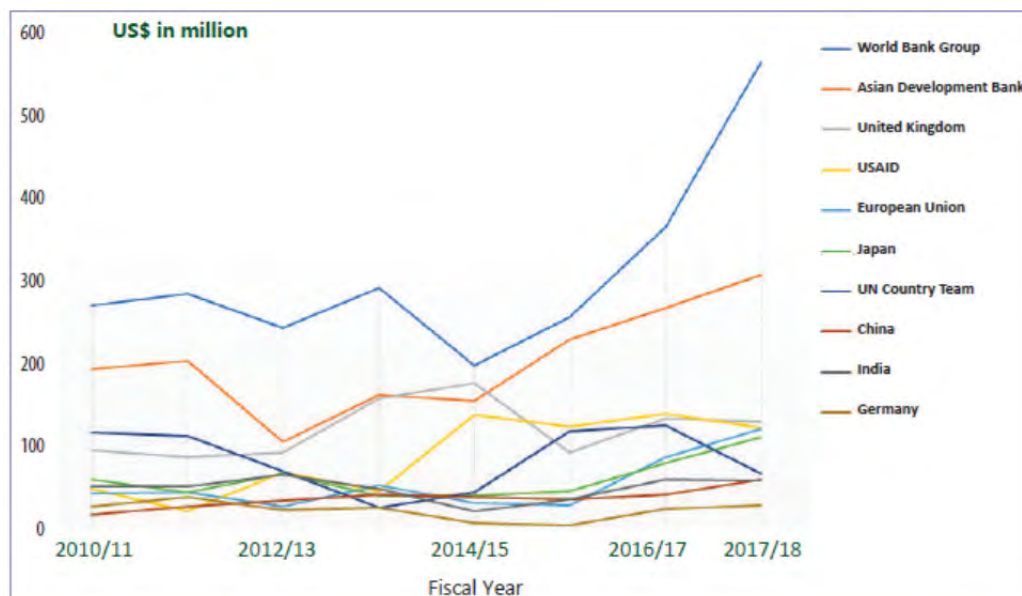


Source: Development Cooperation Report, FY2017/2018, Ministry of Finance

Figure 7.12 ODA Disbursement (million US\$)

The trends of ODA disbursements by the 10 highest-disbursing donors over the last eight years is shown in Figure 7.13. It shows that the disbursement in FY 2017 by most of the 10 DPs increased compared to FY 2016. There was a noticeable decline in disbursement by the UN Country Team, and a slight decline in that of the United Kingdom, USAID and India in FY 2017 compared to 2016.

¹ In FY2017, the On-Budget accounted for 22%, and Off-Budget at 78%, and On-treasury at 66% and Off-Treasury at 34% of ODA disbursement.



Source: Development Cooperation Report, FY2017/2018, Ministry of Finance

Figure 7.13 10 Highest-Disbursing donors to Nepal (million US\$)

In terms of ODA loan amount, it has been increasing versus the total ODA disbursement amount in the recent years, as shown in Figure 7.12. Table 7.2 shows the commitment of loans by the World Bank and ADB, the major donors, and Japan, in the past ten years. Although there are fluctuations depending on the year, can be seen that an average of 29,000 million NPR or around US\$ 260 million and 26,000 million NPR or around US\$ 230 million have been committed by the World Bank and ADB, respectively, in the past ten years.

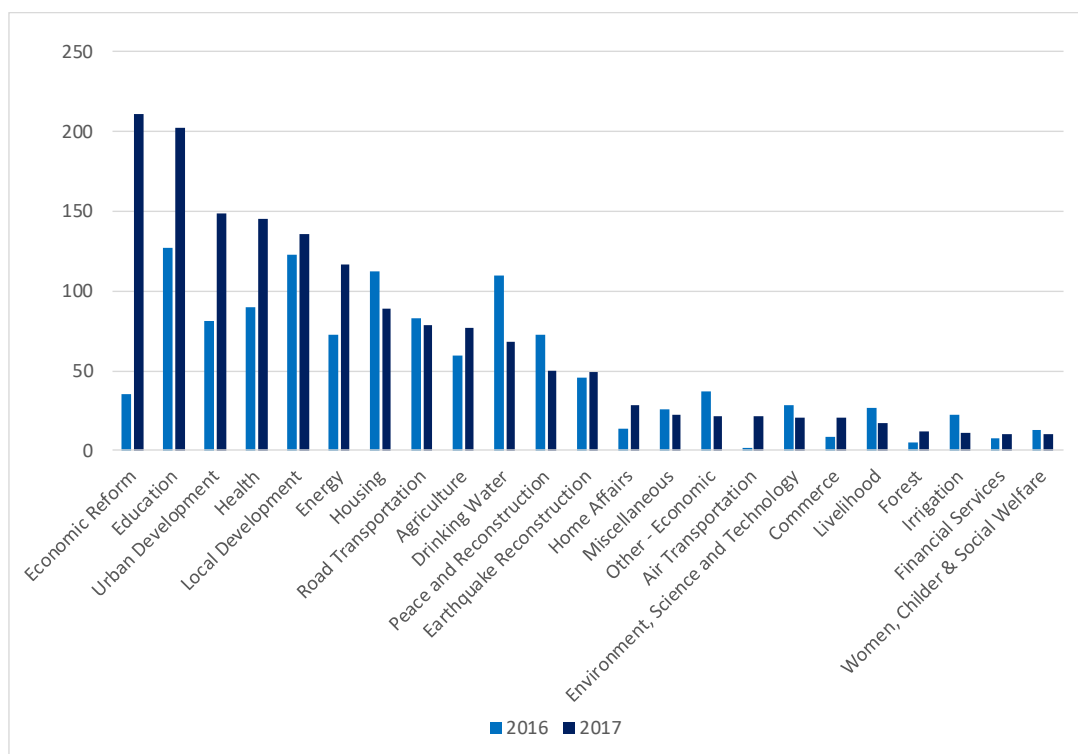
Table 7.2 Loan Commitments by the WB, ADB, and Government of Japan
(in million US\$)

	The World Bank	ADB	Government of Japan
2009	173	172	-
2010	168	278	-
2011	206	105	-
2012	104	119	-
2013	276	305	155
2014	220	351	-
2015	385	290	215
2016	205	120	153
2017	435	509	-
2018	440	100	-

Note: 2018 figures are up to July

Source: JICA

Figure 7.14 shows the sector-wise ODA disbursement to Nepal in FY2016 and FY2017. The top five sectors, economic reform, education, urban development, health and local development account for around 52.1% of the total. The road transport sector has received US\$ 83.3 million and US\$ 78.3 million in FY2016 and FY2017, respectively.



Source: Development Cooperation Report, FY2017/2018, Ministry of Finance

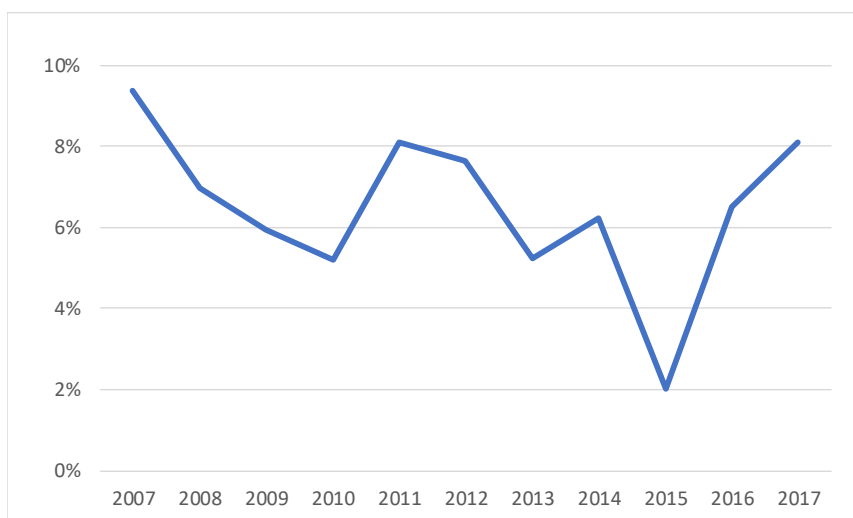
Figure 7.14 Sector-Wise ODA Disbursement, FY2016 and FY2017

7.3 Financing of Transport Projects

7.3.1 Transport sector in Nepal

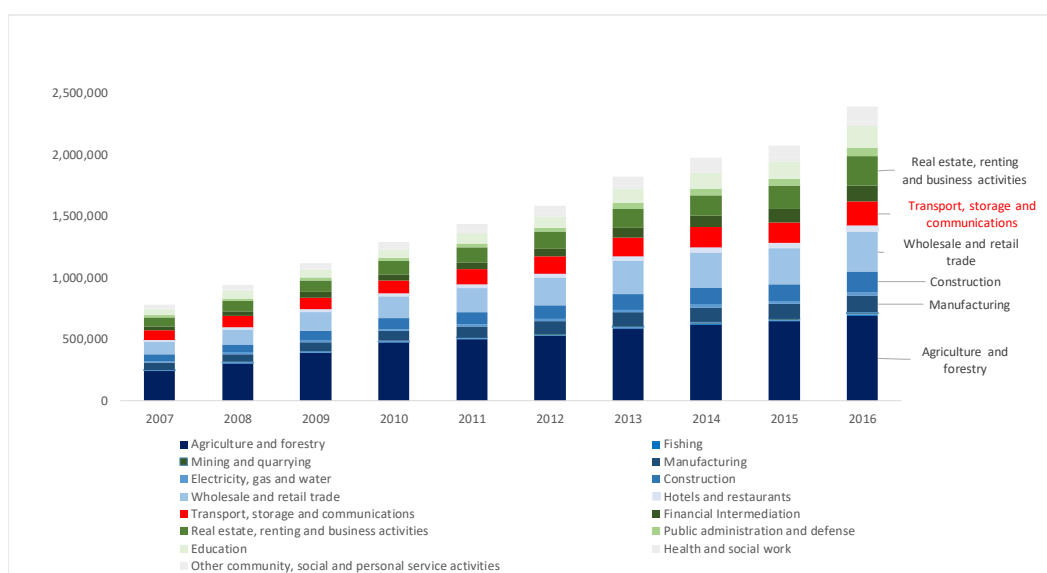
In Nepal, there is a total road network of 80,078 km. Out of a total of 75, only 67 district head quarter's roads are linked with all-weather roads. Most of these roads are basic road connectors and require regular maintenance, upgrading, and further road connection to other districts. The other means of transportation include Nepal's railway line, with a total length of 57 km out of which only 5 km is currently operating. Also, the country operates 1 international airport and 56 domestic airports.

As shown in Figure 7.15, the transport sector accounted for 8.11% of GDP and grew 6.8% in FY2016. Although there have been fluctuations over the years, the average growth rate from FY2013 to FY2016 has been 6.32%. Moreover, the Gross Value Added of the transport, communication and warehousing sector reached 193 billion NPR in FY2016, as shown in Figure 7.16. Over the next five years, the government is targeting to mobilize US\$ 8.2 billion for road infrastructure, rail connectivity and transport sector management.



Source: Ministry of Finance

Figure 7.15 Annual Growth Rate to GDP of the Transport, Storage and Communication Sector (at current price)



Source: Central Bureau of Statistics

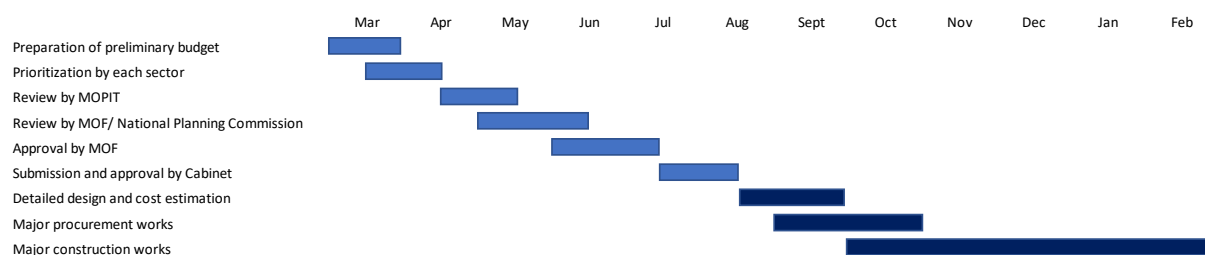
Figure 7.16 Gross Value Added by Industrial Division (at current price, million NPR)

7.3.2 Budgeting Procedure

The basic budgeting procedure is shown in Figure 7.17. From around March of each year, preliminary budget information from relevant offices, projects, units and branches are collected by each sector, which then is prioritized and submitted to the Ministry of Physical Infrastructure and Transport (MOPIT). After review and further prioritization by MOPIT, it is then submitted to the Ministry of Finance (MOF), which scrutinizes the proposed budget by each ministry along with the National Planning Commission (NPC). At this time, series of meetings will be held with each sector offices and MOF. Once MOF completes the review of all budgets from all ministries, it is submitted to the NPC for final approval. Once approved, it is submitted to the Cabinet for approval by Parliament, which is held from around July to August.

Post-budget approval, each ministry receives the confirmed budget from MOF, and each sector performs the detailed design and cost estimation according to the approved budget, and procurement is conducted.

For the road sector, usually the procurement is held from July-September for major works, to be completed by the end of the monsoon season so that the major construction works can start from October.



Source: JICA Study Team, based on interview with MOF, DOR, and local consultant

Figure 7.17 Budgeting Timeline Sample

7.3.3 Budget and Expenditure of the Transport Sector Projects

Table 7.3 shows the annual budget and actual expenses of the Department of Roads (DOR). The budget allocated to DOR has seen a constant rise every year, which is evident that infrastructure development is given more attention than before. Among the total budget of MOPIT in the fiscal year 2013, 88% was allocated to the DOR, and 12% to the other sectors, namely railway and airport sectors.

Table 7.3 Annual Budget and Expenditure of DOR

(in million NPR)

FY	Allocated Budget	Actual Expenses				
		Construction	Upgrading	Maintenance	Miscellaneous	Total
2010	23,609	13,244	2,827	917	3,458	20,446
2011	23,542	8,709	8,261	1,460	862	19,292
2012	28,568	10,151	8,036	2,073	1,572	21,832
2013	34,518	8,497	5,025	5,921	8,518	27,961

Source: Department of Roads

For the road sector, the Road Board Nepal (RBN), an agency which controls the road fund, was established under MOPIT to manage the road fund. The funds of the RBN are specifically utilized for the maintenance of roads, and shared between the central government as well as the municipalities. Although the legislation states that collected resources of the fund shall be received directly by DOR, according to DOR, at this moment, it is first received by MOF and then allocated to DOR, since currently, tax and fees are collected by MOF. As shown in Table 7.4, the funding sources of RBN include fuel levies and vehicle registration fees, and a small share of toll.

Table 7.4 Resources of Road Board Nepal

(in million NPR)

FY	Allocated by MOF		Collected by RBN	Total Maintenance	Allocated Budget to RBN by MOF
	Fuel Levy	Vehicle Registration	Toll		
2004	199	150	N/A	349	220
2005	226	152	41	419	363
2006	228	168	39	435	330
2007	247	251	47	545	390
2008	500	444	40	984	760
2009	741	688	50	1,479	665
2010	927	1,459	65	2,451	1,315
2011	1,759	1,598	65	3,422	2,518
2012	2,080	1,440	73	3,593	2,768
2013	2,333	2,297	58	4,688	2,574
2014	2,473	2,615	67	5,155	4,000

Source: Road Board Nepal

It should be noted that currently, Nepal is under the process of decentralization. For the transport sector, it is undergoing a gradual transformation process, but still is at the initial stage and will take more time to create the structure and framework for adequate budgeting and financing. For the road sector, for provincial roads, some of the budget has been directly provided to the provincial government, but due to inexperience, support from DOR is often necessary. Moreover, according to DOR, there were cases where DOR handed the provincial government to manage certain roads, but the provincial government couldn't complete the works, so the works were returned to DOR.

7.4 Summary

The summary of the financial situation of the Government of Nepal are as follows:

- At macro level, overall, with a GDP growth rate at 7.9% in FY2017, positive economic growth and sound government finances are seen. With the government going through fiscal reforms, negative current account balance from trade deficit and fiscal deficit, with continued high remittance inflows, which has reached 27.9% of GDP in 2017, need to be monitored. However, with the government's efforts in fiscal reform, the debt balance to GDP has decreased to 26.4% in 2017 from 60% in 2003.
- IMF's near-term outlook for economic growth of Nepal is favorable, although macroeconomic and financial vulnerabilities need to be monitored. Furthermore, IMF Article IV consultation (debt sustainability analysis) in 2018 has stated that Nepal's risk of external debt distress and overall debt distress remain low.
- The transport sector account for around 8.11% of the GDP and has shown a positive growth rate for the past ten years, which shows the importance of the sector to the overall development of the country.
- Within the transport sector, the road sector utilizes majority of the budget of MOPIT. Obtaining maintenance budget for sustainability of roads has been a challenge for the country, though use of the funds of the Road Board Nepal has supported the situation. Direct sourcing of the funds shall be implemented in the near future.
- In terms of ODA loan disbursement, the amount has been increasing in the recent years. The major donors are the World Bank and ADB, an average of around US\$ 260 million and around US\$ 230 million have been committed by the World Bank and ADB, respectively, in the past ten years.

**Appendix 8 Draft Project Design Matrix (PDM)
for TA**

APPENDIX 8 DRAFT PROJECT DESIGN MATRIX (PDM) FOR TA

The draft project design matrix (PDM) for TA is described from the following page.

Project Design Matrix (PDM) (Draft 20190404)

Project Title: The Project for Introduction of the Urban Traffic Management Guidelines in Kathmandu Valley

Implementing Agency: Department of Roads (DoR), Department of Traffic Management (DoTM), Kathmandu Metropolitan City (KMC), Kathmandu Metropolitan Police Division (KMPD)

Period of Project: 3 years

Project Site: Kathmandu Valley

Narrative Summary	Objectively Verifiable Indicator	Means of Verification	Important Assumption
Overall Goal			
Safe and smooth traffic flow on major urban roads in Kathmandu Valley is achieved**. **This achievement is expected 3 years after the TA completion.	<ul style="list-style-type: none"> Traffic volume throughput capacity of the urban main roads is increased at least by ##%. Number of traffic accident caused by human errors factors and involving pedestrian on urban roads in the valley is reduced by ##%. 	<ul style="list-style-type: none"> Control delay at intersection by periodic traffic survey or GPS probe data from buses Statistics/Database of road accident and victims information 	
Project Purpose			
The capacity to implement intersection improvement, traffic safety education, and traffic regulation in Kathmandu Valley by counterpart (C/P) agencies is enhanced.	<ul style="list-style-type: none"> Traffic volume throughput capacity of the intersections under pilot project(s) is increased by ##% compared to that of baseline survey. 	<ul style="list-style-type: none"> Control delay at intersection (by traffic survey or GPS probe data) 	<ul style="list-style-type: none"> Traffic volume does not grow drastically during the project period.
	<ul style="list-style-type: none"> Intersection improvement activities are implemented in accordance with the schedule proposed in UTMP**. **UTMP: Urban Traffic Management Plan	<ul style="list-style-type: none"> Project reports 	
	<ul style="list-style-type: none"> Traffic rules and manners awareness campaigns are continuously conducted and public awareness level on traffic rules and manners becomes level "3" or more in a five "5" point scale by Month/Year. 	<ul style="list-style-type: none"> Number of media coverage / Interview (questionnaire) to the citizens in KV 	
Outputs			
1. Urban traffic management policy is strengthened. [UTMP, with government officers] - Set vision, strategy, and plan the followings: o Intersection improvement plan (physical/geometric improvement, signal installation) o Traffic safety education plan o Traffic enforcement strengthening plan o Sustainable funding/financial plan - Set monitoring plan/tool (GPS probe data, etc.) - Further TA/Grant Aid scheme	1.1 UTMP is approved by the GON by Month/Year.	<ul style="list-style-type: none"> UTMP 	
	1.2 Percentage of correct answers of endline survey on urban transport management policy from concerned officers increases by ##% compared to that of the baseline survey.	<ul style="list-style-type: none"> Examination/ Questionnaire to concerned officers who attend the training/seminar 	
2. Urban intersection improvement capacity is enhanced. [Urban Traffic Management Guidelines (UTMG)] - A series of technical manuals/guidelines pertaining to: o Physical (geometric) improvement of urban road intersection (e.g. lane width) o Traffic signal operation and installation [Pilot project on intersection improvement] - To be conducted at selected intersection to demonstrate the introduction of the guideline which may includes o Physical/ geometric improvement project o Traffic signal installation project	2.1 A series of technical guidelines on traffic management as parts of UTMG are developed by Month/Year.	<ul style="list-style-type: none"> Draft technical manuals/guidelines 	
	2.2 Level of skills and knowledge on technical guidelines of the UTMG of ## key officers from C/P agencies are improved to trainer level by Month/Year.	<ul style="list-style-type: none"> Training evaluation report 	
	2.3 ## of key officers participate in the preparation and the implementation of the pilot project(s) to test the applicability of proposed manuals/guidelines.	<ul style="list-style-type: none"> Pilot project report 	
	2.4 ## of key officers are able to develop similar improvement plan at other intersections following technical guidance from JICA experts by Month/Year.	<ul style="list-style-type: none"> Improvement plans/proposals from the key officer 	
	2.5 UTMG is developed and approved by the C/P agencies by Month/Year	<ul style="list-style-type: none"> UTMG 	
3. Traffic signal operation and maintenance capacity is improved. [Principle and practices in traffic signal operation and maintenance]	3.1 Traffic signal maintenance manuals is developed by Month/Year as part of UTMG.	<ul style="list-style-type: none"> Manual(s) as part of UTMG 	<ul style="list-style-type: none"> Budgets for the project are secured by C/P agencies
	3.2 ## of key officers successfully complete the training on traffic signal operation design and maintenance.	<ul style="list-style-type: none"> Training evaluation report 	
	3.3 Traffic signal maintenance is conducted routinely in accordance with the manual and number of breakdown is negligible.	<ul style="list-style-type: none"> Maintenance record 	
4. Capacity for implementing road safety education and awareness program is	4.1 Guidelines for safe road user behavior is developed by Month/Year.	<ul style="list-style-type: none"> Guidelines 	

<p>enhanced.</p> <p>[Road safety management] - Awareness campaign for vulnerable road users (pedestrians, motorcyclists, etc.)</p> <p>[Safe road user behavior] - Education and awareness strategy on traffic rules and manners; - Action plan on road safety education - Pedestrian crossing facilities improvement plan in urban area</p>	4.2 Road safety education materials for vulnerable target groups are prepared by Month/Year.	• Booklet / Leaflet/ Toolkit		
	4.3 Percentage of correct answers of endline survey on traffic rules and manners from participants of awareness campaign increases by ##% compared to that of baseline survey.	• Questionnaire to participants		
	4.4 At least ## driver trainer(s) of driving schools, ## representatives of bus entrepreneur/route associations, and ## operation manager(s) of prominent transport companies servicing in Kathmandu Valley participate in the road safety seminar organized by C/P agencies.	• Seminar reports		
<p>5. Traffic enforcement capacity is improved.</p> <p>[Safe and smooth traffic flow with proper enforcement by traffic police] - Traffic rules enforcement program (violation and penalty) - Enforcement supporting devices/ technologies (camera, etc.) in view of effectiveness, efficiency, and safety.</p>	5.1 Traffic rule enforcement program is developed by Month/Year.	• Draft UTMG • Training evaluation report		
	5.2 Road accident database system is developed by Month/Year.	• Road accident database system		
	5.3 Operation manual of traffic enforcement devices is developed.	• Manual		
	5.4 At least ## traffic police officers attended training and able to demonstrate good enforcement practice.	• Training evaluation report		
Activities		Inputs		Pre-conditions
	Japanese Side	Nepalese Side		
<p>[1. Policy Making]</p> <p>1.1 To review the current policy and legal framework pertaining to traffic management Kathmandu Valley;</p> <p>1.2 To review the conditions of urban traffic;</p> <p>1.3 To prepare the UTMP with concerned government officers;</p> <p>1.4 To conduct seminars on urban traffic management policy for C/P agencies.</p>	<p>1. Experts</p> <p>1) Team Leader / Urban Transport Policy</p> <p>2) Intersection Design Engineer</p> <p>3) Traffic Signal Plan/ Operation Engineer</p> <p>4) Road Safety Expert</p> <p>5) Technical Training/ Public Relation</p> <p>6) Traffic Database/ Traffic Survey Engineer/ Monitoring Planner</p> <p>About 80.0 Man-Months</p> <p>2. Pilot Projects</p> <ul style="list-style-type: none"> • Construction works/materials (with Japanese technologies) • Equipment and accessory • System Development (i.e. vehicle tracking, video-monitoring, with Japanese technologies) <p>3. Training Two Times in Japan and Two Times in 3rd Countries</p> <p>4. Seminars' Venue and Materials</p>	<p>1. Counterpart Personnel</p> <ul style="list-style-type: none"> • Sufficient number shall be assigned from DOR, DOTM, KMC, KMPD <p>2. Provision of Office Space</p> <p>3. Detail Design, Civil Works and Installation Cost for Pilot Projects Equipment</p> <p>4. O&M Cost for the Equipment or Device Provided by Japanese Side</p>		
<p>[2. Main Intersection Improvement] (Engineering)</p> <p>2.1 To develop technical guidelines pertaining to physical (geometric) improvement of urban road intersection and traffic signal installation;</p> <p>2.2 To conduct training on technical guidelines including on-the-job training;</p> <p>2.3 To review the conditions of urban traffic;</p> <p>2.4 To select target intersection(s);</p> <p>2.5 To examine improvement measures (geometric improvement, signal control, etc.);</p> <p>2.6 To implement pilot project(s) taking into consideration of improvement measures;</p> <p>2.7 To make develop improvement plan for other intersection(s).</p> <p>2.8 To finalize the UTMG</p>				
<p>[3. Traffic Signal Operation & Management] (Engineering)</p> <p>3.1 To review the traffic signal controlling system in overseas.</p> <p>3.2 To review basic policy for the traffic signal specification and the controlling system and to draft their standards</p> <p>3.3 To prepare manual on operation & maintenance of traffic signal;</p> <p>3.4 To conduct trainings based on the above and to conduct training including OJT.</p>				
<p>[4. Road Safety Awareness] (Education)</p> <p>4.1 To examine the traffic awareness condition;</p> <p>4.2 To develop guidelines for safe road user behavior;</p> <p>4.3 To prepare road safety education materials;</p> <p>4.4 To conduct awareness campaigns for target groups (vulnerable road users such as pedestrians, motorcyclists);</p> <p>4.5 To give lecture on traffic safety program to driver trainers from driving schools, bus entrepreneur/route</p>				

<p>associations, and operation managers of transport companies in Kathmandu Valley.</p>			
<p>[5. Traffic enforcement capacity] (Enforcement) 5.1 To examine traffic violation characteristics; 5.2 To develop traffic rule enforcement program; 5.3 To develop traffic accident database management system; 5.4 To provide support on introduction of traffic enforcement devices; 5.5 To conduct training for traffic police officers on implementation of effective, efficient, and safe enforcement of traffic regulation.</p>			

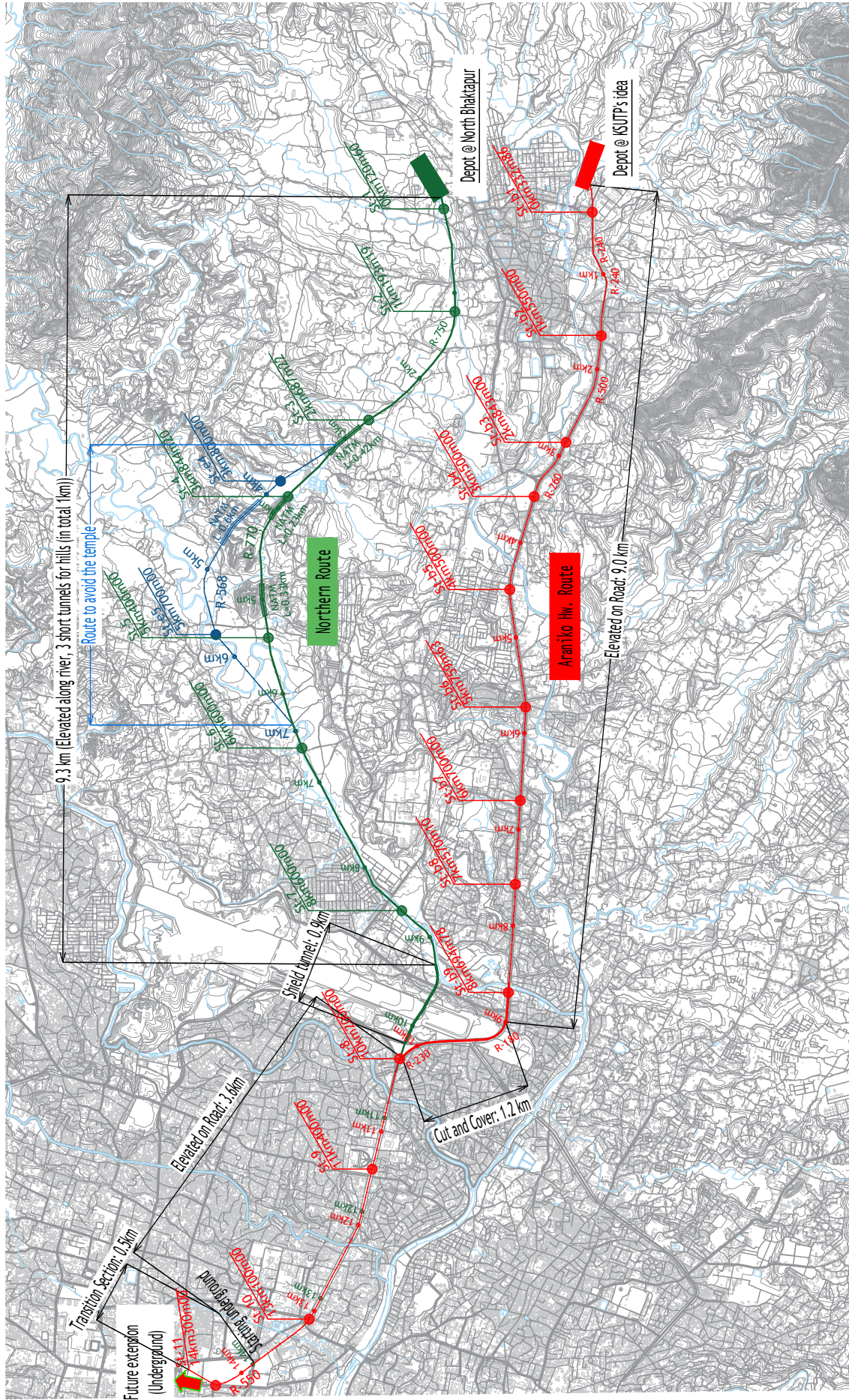
Appendix 9 Detailed Railway Route Plan

APPENDIX 9 DETAILED RAILWAY ROUTE PLAN

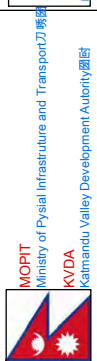
The detailed railway route plan is described from the following page.

Detailed Railway Route Plan

SCALE 1:20000 (1:40000)



DATA COLLECTION SURVEY ON URBAN TRANSPORT
IN KATHMANDU VALLEY
IN FEDERAL DEMOCRATIC REPUBLIC OF NEPAL



ORIENTAL CONSULTANTS GLOBAL
Global Consulting for Sustainable Development

SUB PROJECT:

SCALE: AS SHOW
JUNE 2019

Detailed Railway Route Plan

DWG. NO.

01

**Appendix 10 Review of Macroscopic Transport
Demand Analysis Model**

APPENDIX 10 REVIEW OF MACROSCOPIC TRANSPORT DEMAND ANALYSIS MODEL

The JICA Masterplan has initiated the transport demand analysis model development which was completed in 2017. It is designed with the ordinary 4-step methodology and substantiated with numerous household and roadside interview surveys and roadside traffic counting in 2012. It is designed for strategic analysis of future road traffic demand for the master plan objectives. It consists of traffic generation/attraction model, distribution model, mode-choice model, and network assignment model. The network assignment was handled by the JICA STRADA package software. The set of models had been completed in 2016 and utilized for the 2017 Master Plan analysis. Hereafter, this is called the JICA MP Model.

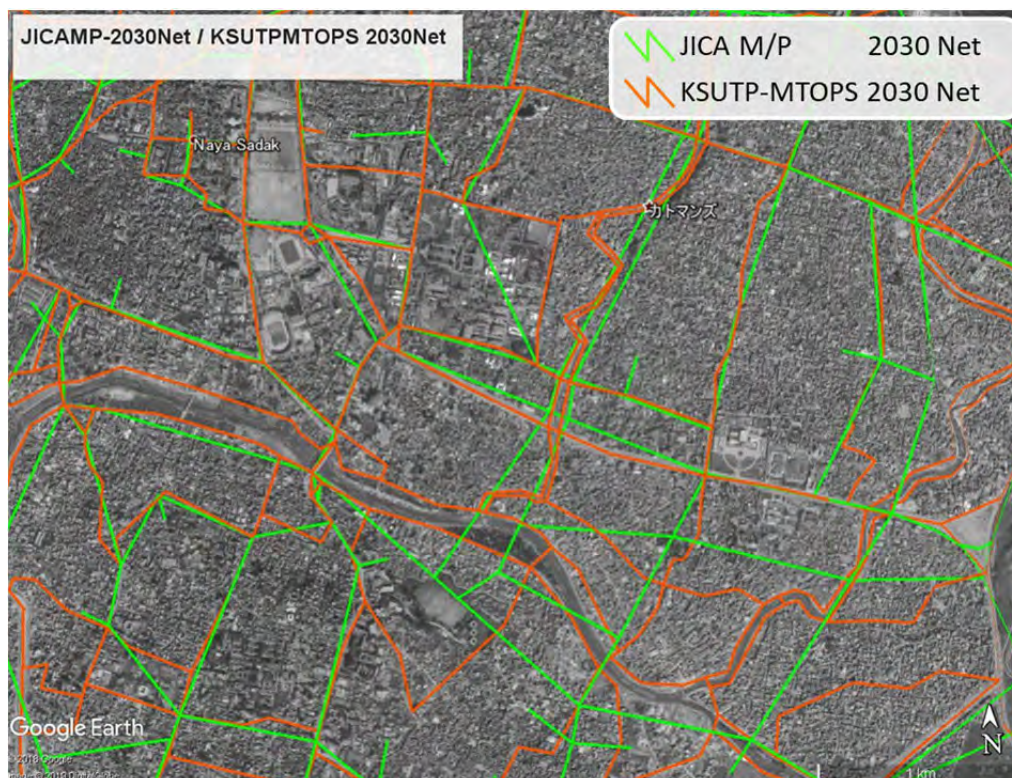
KSUTP-MTOPS, which was implemented during 2017-18 by ADB, was handed over the resources of the JICA MP Model, and modified the model for the Mass Transit Feasibility assessment. The modification has contributed to the improvement of model quality in the following three aspects:

Network setting quality: The KSUTP-MTOPS team conducted a set of road assets surveys, prepared the proper alignment of existing road network in GIS, and incorporated it into the network model. Additionally, the KSUTP-MTOPS team reviewed the latest road development plan and idea for the year 2030 and 2040 scenario with DOR, and improved the road development scenario with qualified alignment. Figure 10.1 shows that the accuracy of road alignment were improved by the KSUTP-MTOPS model. This JICA survey (Data Collection Survey) aims to assess the intersection improvement by the network assignment model, and the quality of network setting is essential to the study. It is advantageous to use the KSUTP-MTOPS network setting.

Traffic Analysis Zone (TAZ) setting: The JICA study team developed origin-destination (OD) matrices for each trip purpose and for each transport mode within the 93 traffic analysis zones (TAZs) system. To evaluate the traffic demand on mass transit options, KSUTP-MTOPS disaggregated the 93 TAZs-based OD matrices into 171 TAZs for each scenario. The refined zone plan enabled for a more detailed modeling of the proposed mass transit systems, as well as intersection improvement assessment for the JICA data collection survey.

Population Scenarios Setting: The KSUTP team has incorporated the latest KVDA new city development scenario in 2018 after a long consultation with KVDA. Table 10.1 shows the difference between the JICA MP and KSUTP-MTOPS population setting for Kathmandu Valley. The population scenario settings of the KSUTP-MTOPS are 1.3-1.5 times larger than that of the JICA MP. However, the KSUTP-MTOPS adopted this scenario as per the request of the KVDA new city development trend.

The survey team has consulted with KVDA and other stakeholders in the interim WG (11 February) and the participants agreed on the scenario.



Source: JICA Study Team

Figure 10.1 Quality Difference of the Network Setting between JICAMP/KSUTP

Table 10.1 Population Scenario Difference

MTOPS – Scenario	2016	2020	2030	2040
Population (A)	3,740,432	4,169,643	4,924,467	5,728,718
Generated Traffic (C)	4,123,713	5,972,482	7,200,132	8,755,482
Generated Traffic per Person	1.10	1.43	1.46	1.53
Vehicle Ownership per Household	69.43%	73.30%	83.35%	92.05%
JICA Master Plan Scenario	2011	2020	2030	
Population (B)	2,439,760	3,120,000	3,724,000	
Generated Traffic (D)	3,438,393	4,418,205	5,324,470	
Generated Traffic per Person	1.41	1.42	1.43	
Vehicle Ownership per Household	62.79%	74.51%	79.47%	
Population Comparison (A)/(B)	1.533	1.336	1.322	--
Generated Traffic Comparison (C/D)	1.199	1.352	1.352	

Source: JICA Study Team